PB90-162785

Superfund Record of Decision (EPA Region 5): Hedblum Industries, MI (First Remedial Action), September 1989

(U.S.) Environmental Protection Agency, Washington, DC

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U.S. Department of Commerce
National Technical Information Service
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United States
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Office of
Emergency and
Remedial Response

EPA/ROD/R05-89/112
September 1989

EPA

Superfund Record of Decision:

Hedblum Industries, MI

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First Remedial Action - Final

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800/000

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16. Abstract (Limit: 200 words)

Hedblum Industries site, an automotive parts manufacturing plant, is approximately one mile southwest of the town of Oscoda, in AuSable Township, Iosco County, Michigan. In addition to the plant, the site consists of a ten-acre industrial park, a wetland area, and residences including the AuSable Heights subdivision. Ground water flows beneath the plant and subdivision and discharges via a bayou into the AuSable River. Between 1968 and 1972 the previous plant operators discharged cooling water, rinse water, and approximately 4,000 gallons of waste TCE onto the ground. In 1973 VOCs were detected in residential wells in the AuSable subdivision. Contaminated wells were replaced with deeper wells which by 1977 also showed traces of contamination. Subsequently, the Oscoda Township Municipal Supply System was extended to residents through the installation of a new water main. An underground storage tank containing TCE, TCA, and PCE was removed from the site in 1980. The primary contaminants of concern affecting the ground water are VOCs including benzene, toluene, xylenes, TCE, and PCE; and metals including lead.

The selected remedial action for this site includes ground water pumping and treatment using activated carbon adsorption with discharge to the bayou; and ground water and soil monitoring. The estimated present worth cost for this remedial action is $1,379,000, which includes an annual O&M cost of $264,000 over 4-5 years.

17. Document Analysis a. Descriptors
Record of Decision - Hedblum Industries, MI
First Remedial Action - Final
Contaminated Media: gw
Key Contaminants: VOCs (benzene, toluene, xylenes, TCE, PCE), metals (lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 59
	20. Security Class (This Page) None	22. Price A04

(See ANSI-Z39.18) *See Instructions on Reverse*

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

DECLARATION

SITE NAME AND LOCATION

Hedblum Industries
Oscoda, Michigan

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Hedblum Industries site developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9601, as amended by the Superfund Amendments and Reauthorization Act of 1986 and consistent with the National Oil and Hazardous Substances Pollution Contingency Plan to the extent practicable.

This decision is based upon the contents of the administrative record for the Hedblum Industries Site.

The State of Michigan does not concur with the U.S. EPA's Record of Decision. The Michigan Department of Natural Resources (MDNR) has indicated that they agree with the remedial technology selected by U.S. EPA to remediate the Hedblum Industries site. However, the State of Michigan does not concur with the cleanup level for Trichloroethene specified in the Decision Summary.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present a current or potential threat to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for the site was developed to protect public health and the environment by preventing ingestion and inhalation of contaminants found in the groundwater, and by restoring the contaminated aquifer.

The major components of the selected remedy are as follows:

- Installing an extraction well system in the AuSable Heights subdivision and one well downgradient from the plant.

- Pumping extracted water to the site for treatment using activated carbon.

- Discharging effluent water from the treatment using activated carbon.
- Monitoring groundwater quality at the subdivision throughout the extent of the implementation of the remedy.
- Abandoning the six MDNR monitoring wells on site.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State applicable or relevant and appropriate requirements, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment to the maximum extent practicable for this site.

This remedy involves groundwater restoration, therefore the remedy will not result in hazardous substances remaining on site above health-based levels.

September 29, 1989
Date

Valdas V. Adamkus
Regional Administrator
U.S. EPA, Region V

DECISION SUMMARY
Hedblum Industries Site

I. SITE NAME, LOCATION, AND DESCRIPTION

The Hedblum Industries Site, 1000 AuSable Road (Old U.S. 23), is located approximately one mile southwest of the town of Oscoda in AuSable Township, Iosco County, Michigan (Figures 1 and 2). The AuSable River is approximately 0.8 miles to the east and flows into Lake Huron which is located 1.2 miles to the east of the site. The site consists of the area in Figure 2 identified as the Hedblum Industries Plant, as well as adjacent areas where contaminated groundwater is presently located or was, at one time, located. The site includes approximately ten acres area designated as an industrial park. The site also includes an adjacent subdivision where contaminated groundwater is presently located or was, at one time, located, and the swampy area adjacenthat to the bayou. The Plant has open access as there are no fences or markings to distinguish the property boundaries. The Plant is bordered on the east by the Detroit and Mackinaw Railroad tracks, which are used 2-3 times per week. There are scattered residences around the site, with most of them in the AuSable Heights subdivision, located to the east and northeast.

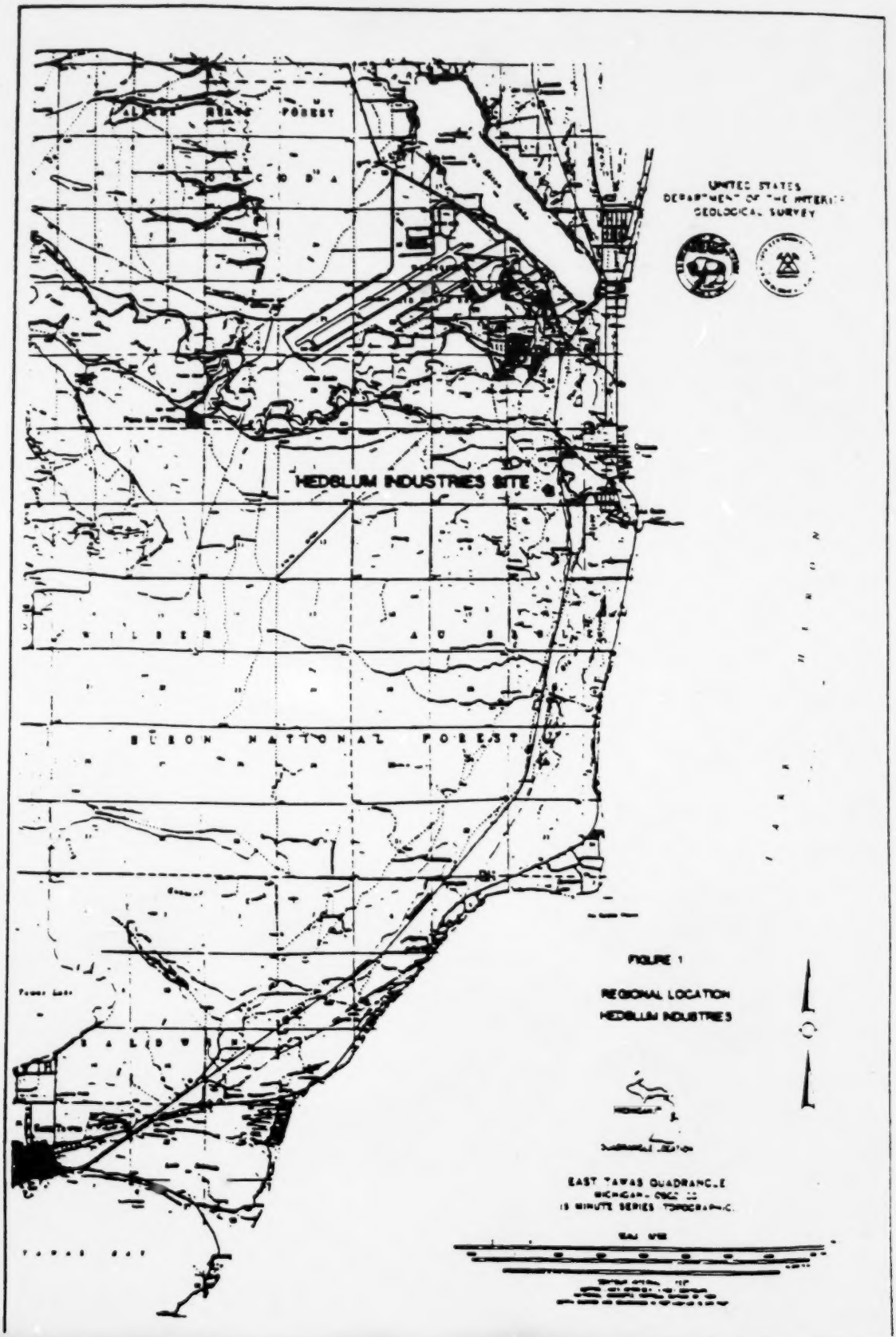
The geology of the site area is characterized by glacial deposits of two distinct units: clay and overlying sand and gravel. The sand and gravel deposits were found to range between 45 and 50 feet in depth at the site and the subdivision. The clay unit is believed to be at least 20 feet thick at the site. The hydraulic connection between the bedrock and the sand and gravel unit is considered insignificant.

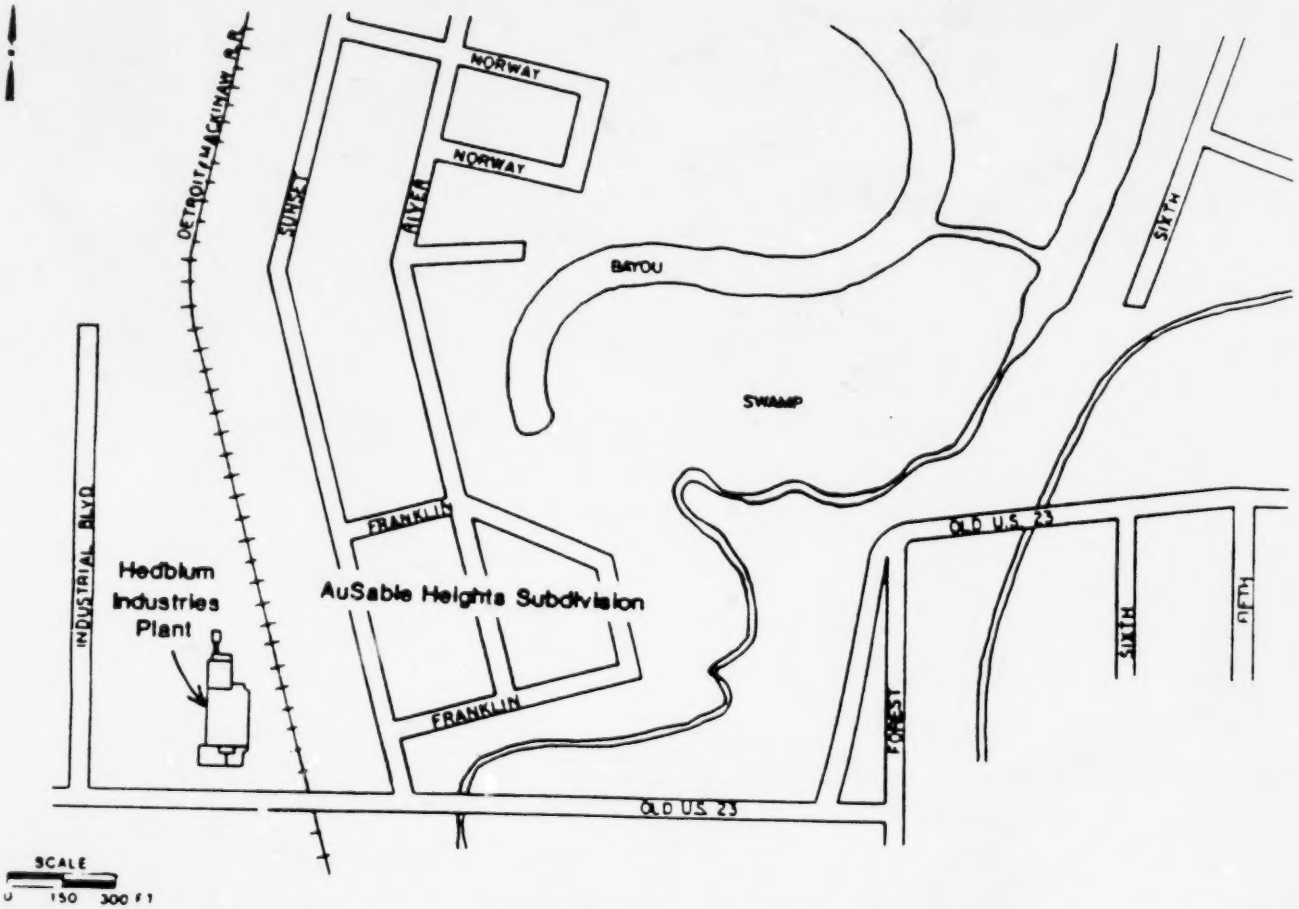
Groundwater flows in a northeasterly direction from the Plant, through the subdivision and toward a bayou to the east of the subdivision. This bayou empties into the AuSable River. The aquifer is estimated to flow at a rate of 12.5 feet per day.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Plant was owned by Dasco Products from 1958 to 1985, during which time it leased the property to several industrial firms that manufactured various parts for the automotive industry. In September 1985, the title to the property was transferred to Aircraft Tool Supply (ATS), the current owner.

The site first came to the attention of regulatory agencies during a 1972 Michigan Department of Natural Resources (MDNR) inspection which noted that the Thomson Corporation, which operated at the site from 1968 to 1972, was discharging cooling and rinse water onto the ground. The plant manager informed the MDNR inspectors that waste trichloroethylene (TCE) was routinely dumped from a loading dock on the northwest side of the building onto the ground from 1968 to 1972. An estimated 4,000 gallons of TCE was disposed of in this manner.


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
HEDBLUM INDUSTRIES SITE
HURON NATIONAL FOREST
FIGURE 1
REGIONAL LOCATION
HEDBLUM INDUSTRIES
EAST TAWAS QUADRANGLE



SITE LOCATION

FIGURE 2

Beginning in 1973, volatile organic compounds (VOCs), primarily TCE, were detected in residential wells to the east and northeast of the plant in the AuSable Heights subdivision. In 1973, residential well sampling revealed contamination at two locations, one with 10.0 mg/l and the other with 1.0 mg/l TCE. The more contaminated well was replaced with a deeper well which showed no detectable TCE. In 1975, two more wells became contaminated. Again, the more contaminated well was replaced with a deeper one.

In 1976, a groundwater study commissioned by Amtel, Inc., which purchased Thomson Corporation in 1974, concluded that the groundwater contamination in the area was attributable to the dumping of TCE at the plant.

In 1977, contamination was found in the water supply wells at the site and in the cooling water discharged to the ground. Also, the deeper residential replacement wells and three additional residential wells showed traces of contamination. Subsequently, the Oscoda Township Municipal Supply System was extended to residents through the installation of a new water main. At the time, 69 out of 90 residents were connected to the system. (Presently, 80 of the 90 residents are connected.)

Samples taken during a 1980 plant inspection trip revealed that an underground storage tank at the site contained TCE; 1,1,1-trichloroethane (TCA); and, tetrachloroethylene (PCE). This tank was excavated and eventually removed from the site. In May 1981, the MDNR constructed seven shallow monitoring wells (each well a maximum of 25 feet total depth) on and adjacent to the site. Soil samples taken during the well installation revealed the presence of TCE and PCE. Water samples taken contained TCE, PCE, TCA, and chloroform. The water levels indicated a northeasterly direction of groundwater movement toward the subdivision.

In 1982, the Hedblum Industries site was placed on the National Priorities List. After offering the Potentially Responsible Parties the opportunity to perform a Remedial Investigation/Feasibility Study (RI/FS), the U.S. Environmental Protection Agency (U.S. EPA) assigned the site to Camp Dresser & McKee, Inc., a U.S. EPA remedial contractor, in 1986 via contract number 68-01-6939 to perform the work. The RI was conducted from January 1987 through August 1987 and included topographical and geophysical surveys; sampling of soils, surface water, and sediments; installation of monitoring wells; and, sampling of groundwater from monitoring, residential, and municipal wells. The FS, completed in May 1989, developed and evaluated several alternatives for addressing contamination problems at the Hedblum Industries site.

III. COMMUNITY RELATIONS

Historically, public interest with the Hedblum Industries site has fluctuated. The 1973 discovery of TCE contamination of private wells resulted in much community interest. At the time, the source of the contamination was not known. After deeper replacement wells were installed to provide an alternate water supply, community concern subsided. Then, in 1977, when these replacement wells were also found to be contaminated, public interest increased greatly. In August 1977, the AuSable Township Board sponsored a community meeting to notify residents of the contamination problem. The meeting was well attended, as the MDNR and local health officials explained the problem and recommended that the Oscoda Township municipal water supply system be extended to serve the AuSable Heights subdivision. Most residents were in favor of the proposal. However, some objected to the cost of connecting to the system. By the end of 1978, the Oscoda Township water supply system was extended and sixty-nine out of ninety houses connected. Subsequently, more residences have hooked up though there are still 10 residences which rely on private wells for water. After the municipal water supply was extended to the subdivision, public interest once again diminished. Local officials have received very few inquiries regarding the TCE contamination since then.

As part of the community relations program, two information repositories have been established near the site, one at the AuSable Township Hall and the other at the Oscoda Public Library. The work plan, community relations plan, fact sheets, RI and FS reports, proposed plan, responsiveness summary, and any other site-related materials that make up the administrative record have been placed in the repositories.

U.S. EPA notified the local community, by way of the Proposed Plan, of the preferred remedial alternative for the Hedblum Industries site. To encourage public participation in the selection of a remedial alternative, U.S. EPA scheduled a public comment period from July 24 to August 23, 1989. In addition, U.S. EPA held a public meeting on August 10, 1989 to discuss the Proposed Plan. U.S. EPA's responses to comments received during the public meeting and to written comments received during the public comment period, including comments that were submitted on September 6, 1989 with U.S. EPA's approval, are included in the Responsiveness Summary.

IV. SCOPE OF RESPONSE ACTION

The selected remedy for the Hedblum Industries site addresses the contaminated groundwater and the associated public health risks from ingestion of the groundwater and inhalation of vapors. Groundwater treatment will be utilized to reduce the levels of VOCs in the aquifer under the AuSable Heights subdivision by pumping and treating the contaminated groundwater.

The remedy also calls for additional soils investigation work to be performed during the pre-design stage in order to verify the extent and magnitude of soil contamination. The remedial investigation included some soils testing which revealed relatively low levels of subsurface contamination at 15 to 40 foot depth. At the present time, a "no action" remedy has been selected for the subsurface soil. If the additional investigation reveals soil contamination that poses a public health risk, this record of decision will be amended to include subsurface soil remediation.

V. SITE CHARACTERISTICS

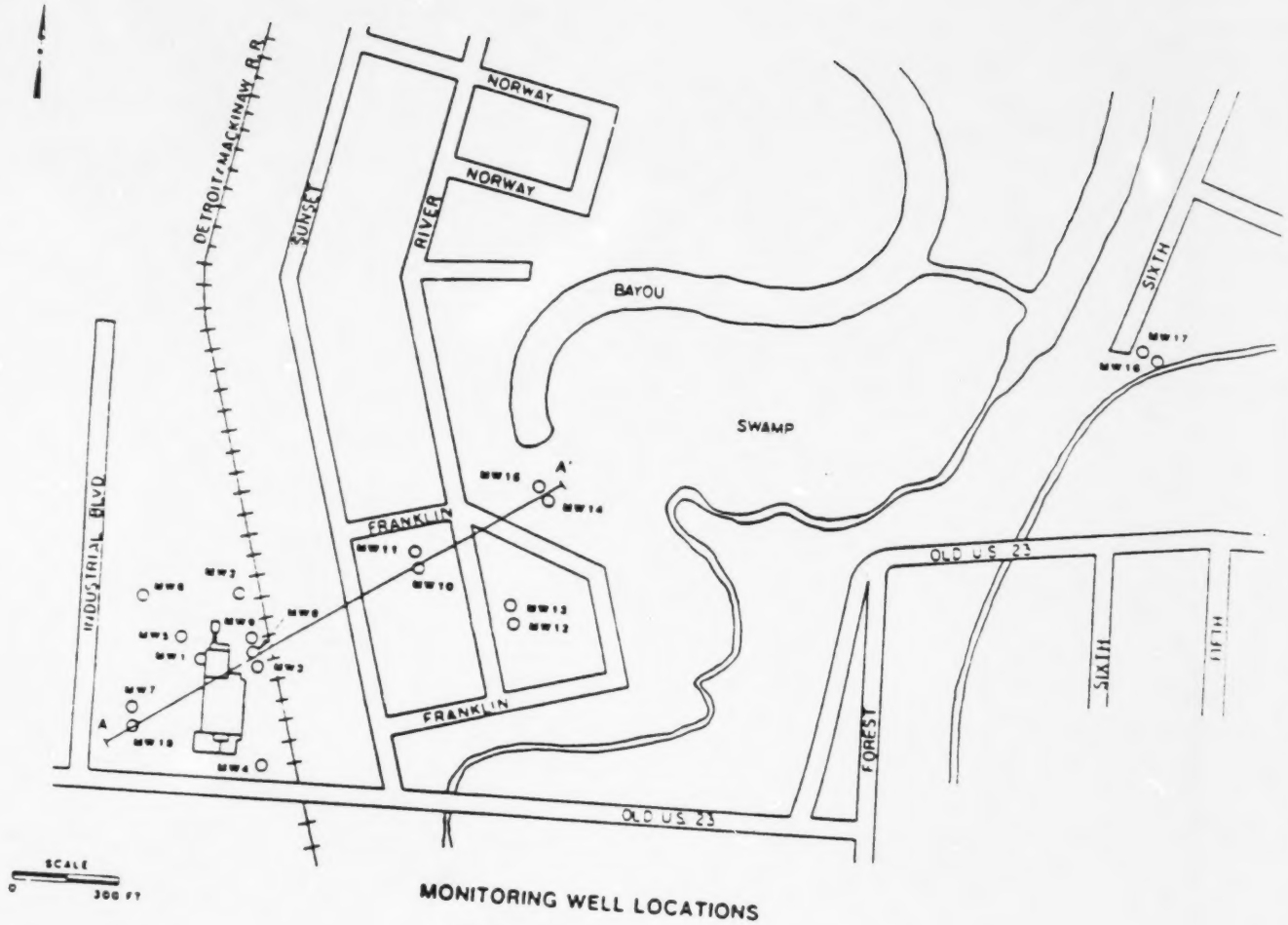
The RI, consisting of on-site scientific studies and laboratory analyses to determine the nature and extent of contamination at the site, has been completed. RI activities were conducted from January 1987 to August 1987 and included the installation of monitoring wells, and the sampling of groundwater, soils, surface water, and sediments. The 1985 populations of Oscoda and AuSable Townships were 11,386 and 2,380, respectively. The population within one half mile radius of the Hedblum Industries site is estimated to be between 300 and 500 persons. The results of the RI are summarized below.

Groundwater

Underlying the Hedblum Industries site and the surrounding area are glacio-lacustrine deposits 200 to 300 feet thick, which overlie bedrock formations of shale, sandstone, and limestone. Specifically, in the study area, glacial deposits consist of two distinct units: clay and overlying sand and gravel. The sand and gravel deposits were found to range from 45 to 50 feet in depth at the site and the adjoining subdivision. The clay unit is believed to be at least 20 feet thick at the site. The hydraulic connection between the bedrock and the sand and gravel unit is considered insignificant. The aquifer of concern is the unconfined sand and gravel unit. Groundwater flows in a northeasterly direction from the site, through the subdivision and toward a bayou to the east of the subdivision. This bayou empties into the AuSable River which in turn flows into Lake Huron (See Figure 2). The velocity of the groundwater is estimated to be 12.5 feet per day. Several residences down-gradient of the site still have private wells tapped into this sand and gravel formation.

As part of the investigation, 11 groundwater monitoring wells were installed at the site, MW-8 through MW-18 (see Figure 3). These wells include 5 well-nests and one single background well. The deep wells were screened in the lowest 10 feet of the aquifer, while the screened interval of the shallow wells varied based on organic vapor analyzer results but are generally in the upper 10 feet of the aquifer. These wells complement 7 groundwater monitoring wells installed in 1981 by the MDNR.

Groundwater samples were taken from the 18 monitoring wells, 5 Oscoda city wells and various residential wells, in two separate sampling



MONITORING WELL LOCATIONS

FIGURE 3

rounds in March/April 1987 and in July 1987. Parameters included full organics and inorganics, including filtered and unfiltered metals and cyanide, total dissolved and total suspended solids. In addition, samples were analyzed for ammonia, nitrate, and nitrite to determine if nearby septic systems had impacted the groundwater. Also, field measurements of pH, specific conductance, and temperature were taken and recorded in the field log book.

Some heavy metals were detected at concentrations exceeding drinking water standards in the groundwater samples from both on-site and off-site monitoring wells. Elevated levels of lead and zinc were found in on-site MDNR monitoring wells. Elevated levels of antimony, manganese, and mercury were found in monitoring wells to the northeast of the site. Arsenic and chromium, previously found during the MDNR's study, were not detected during this investigation of the site.

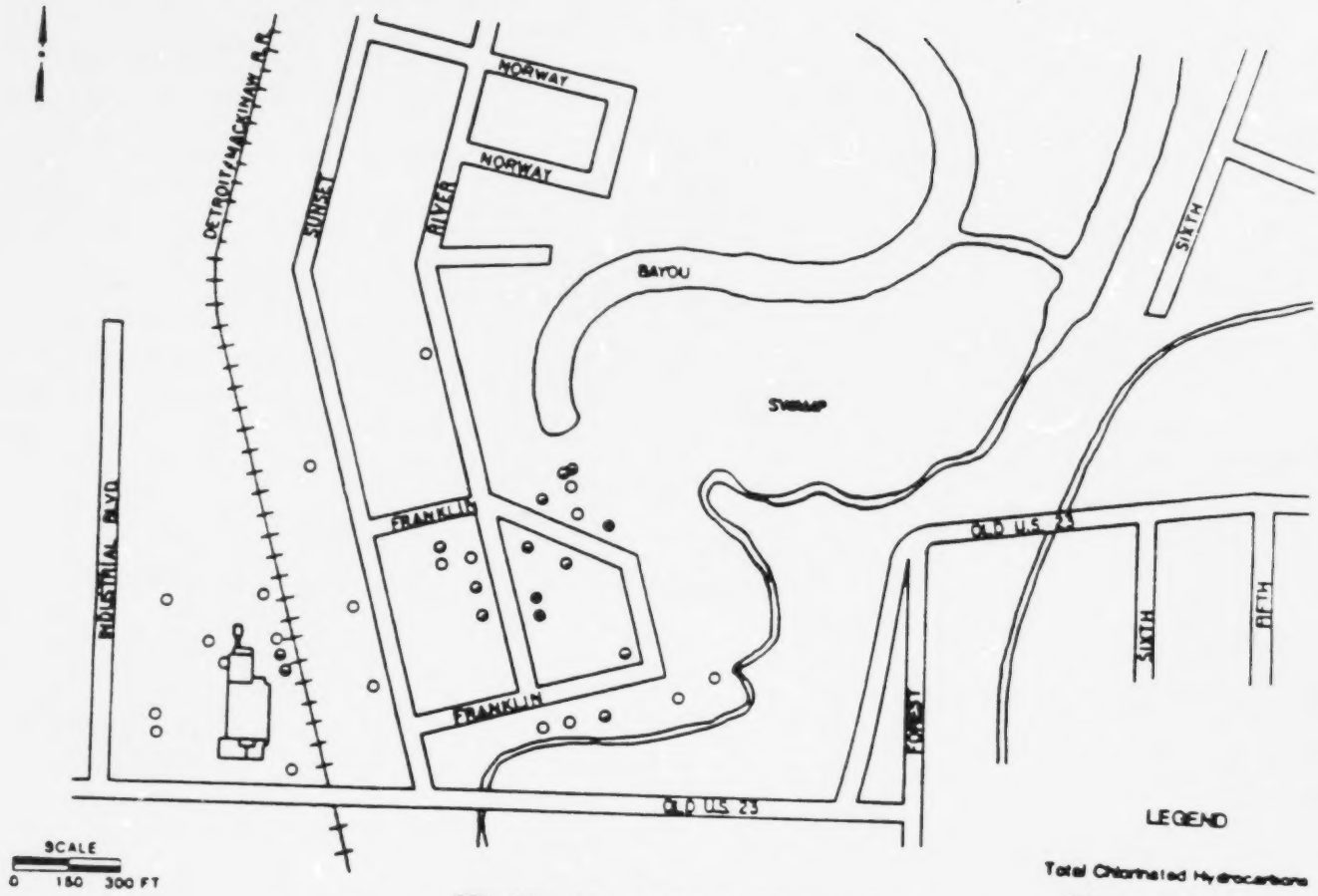
The presence of high concentrations of lead and zinc in the MDNR wells is probably due to well construction. There is no evidence that any inorganic contamination found in the groundwater at or near the site is attributable to site activities.

Nitrates, nitrites, and ammonia from septic systems do not appear to have an adverse impact on the groundwater. The sandy soils in the site area would not be expected to provide organic carbon or nutrients for biodegradation of organic compounds to occur. However, the septic systems do appear to be providing a nutrient source and a reducing environment.

VOC contamination in the groundwater, primarily TCE and TCA, is present at the site and the AuSable Heights subdivision. These concentrations range from low parts per billion (ppb) to 4880 ppb and 3080 ppb for TCE and TCA, respectively. The U.S. EPA primary drinking water standards for these compounds are 5 ppb for TCE and 200 ppb for TCA.

Groundwater contamination was found at the site just east of the plant and in the eastern section of the AuSable Heights subdivision. However, the residential wells sampled between these two areas did not show any contamination. Also, the contaminant concentrations in the subdivision are higher than those at the site. This information does not suggest that the subsurface contamination at the site is an on-going source responsible for the groundwater contamination presently found under the subdivision. Figure 4 shows the spacial distribution of the groundwater contamination plume.

Groundwater sampling results at the subdivision indicate that moderate levels of VOC, 4880 ppb TCE and 3080 ppb TCA, have persisted over a time period inconsistent with simple transport of a slug of dissolved contaminants. If solvents dumped at the site entered solution and were



GROUNDWATER CONTAMINATION PLUME
HEDBLUM INDUSTRIES SITE

FIGURE 4

carried with the groundwater at a velocity of 12.5 feet per day, they would have traveled to, or below, the bayou in less than 100 days. If solvent dumping was stopped in 1972, all VOC contamination should theoretically have passed through the study area. Adsorption and desorption processes should not have significantly slowed the contamination plume migration. All evidence suggests that the aquifer contains very little organic carbon, which is the primary factor in causing adsorption of organic compounds to the soil.

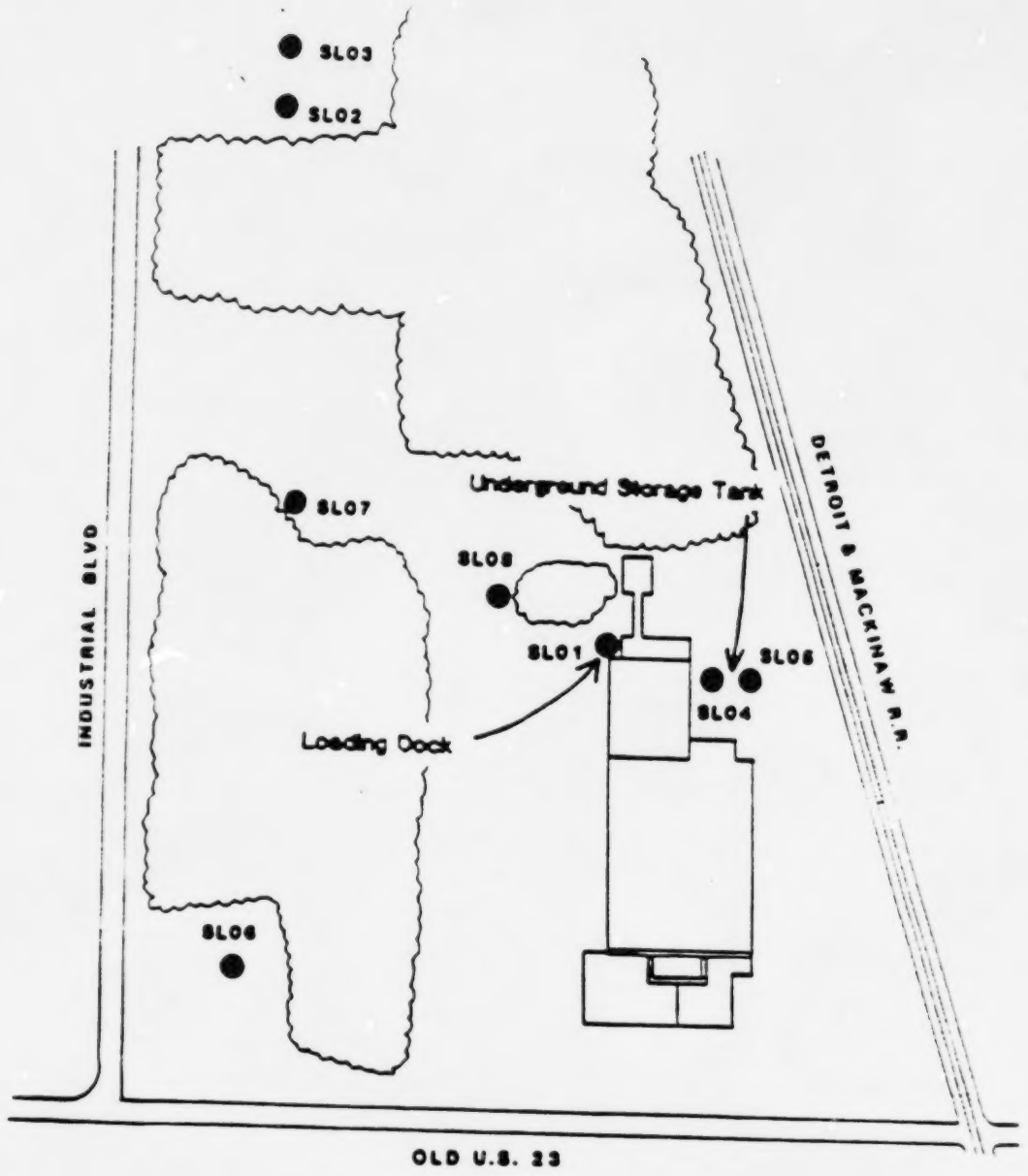
There are two possible explanations of the observed distribution of groundwater contamination and its persistence in the site area. One explanation is that clay lenses may be present in the aquifer, which contain higher organic carbon content. These clay lenses would adsorb organic contaminants and act as a physical barrier to VOC solute migration. VOCs could form small pools in localized clay lense depressions in relatively high concentrations and slowly re-dissolve in the groundwater or could be flushed by the clay barrier. This would account for the moderate levels of contamination on the eastern side of the subdivision.

Another explanation is that VOCs at the leading edge of the contaminant plume may have diffused out of active pore spaces into dead (inactive or unused) pore spaces in the aquifer. Solutes in the dead pore spaces, which are thought to comprise one-quarter to one-third of the total pore space in the aquifer, are essentially trapped and would not move with the groundwater. Once the contaminant plume has moved through the aquifer, the trapped solutes in the dead pore space would slowly move back into the active pore space along a concentration gradient.

Soil

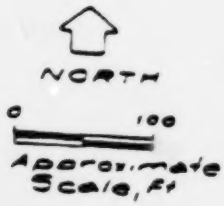
Subsurface soil samples were taken with a power auger at 8 locations from depths of 2, 5, and 10 feet (See Figure 5). Also, split spoon soil samples were taken to depths of approximately 50 feet during the installation of deep monitoring wells (See Figure 6). A total of 56 soil samples were collected and analyzed. Since no regulated chemical criteria exists for soils, the analytical results were compared to background concentrations. There does not appear to be any inorganic contamination resulting from the site activities, as the sample results were within expected ranges when compared to background values. Samples from SL07 and SL08, which were taken to confirm findings from the 1981 MDNR study showing total chromium and arsenic, did not show inorganics exceeding normal concentrations.

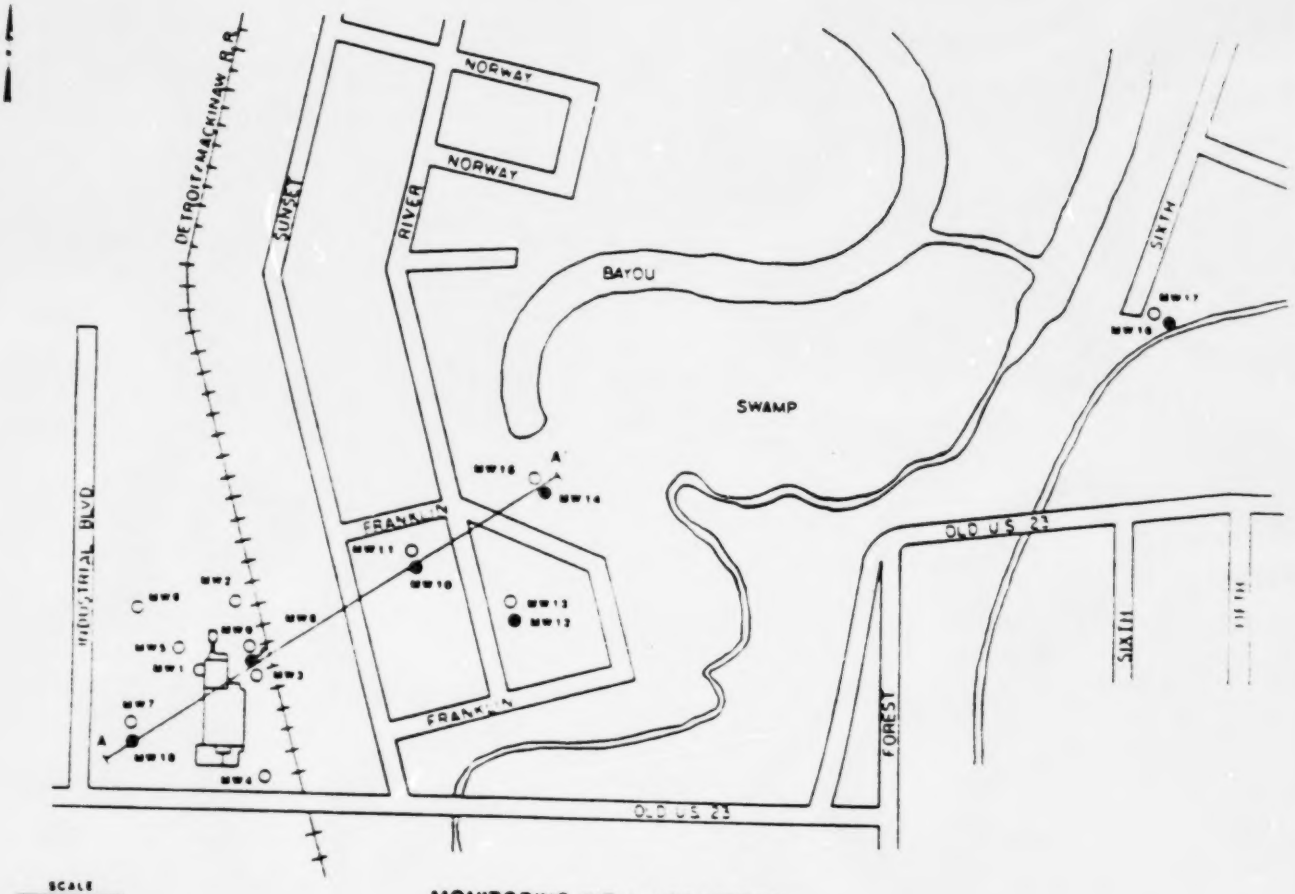
Low levels of TCE and PCE were detected in on-site soil samples taken near the old loading dock (SL01). Also, low levels of TCE, PCE, and TCA were found in the vicinity of the former buried storage tank (SL0



HEDBLUM INDUSTRIES SITE
POWER-AUGER SOIL SAMPLES

FIGURE 5





MONITORING WELL LOCATIONS
SPLIT-SPOON SOIL SAMPLING
FIGURE 6

and SL05). Most split spoon samples taken showed no or only low levels (low ppb) of VOC contamination. Only MW08, placed near the former underground storage tank location, showed appreciable VOC contamination. In this boring, TCE contamination was found between 15 and 50 feet. The highest concentration was 11 parts per million (ppm) at 20 feet.

Surface Waters and Sediments

Figure 7 shows surface water features in the Hedblum Industries area. Because of the sandy soils, transport of contaminants from the site is largely through the groundwater system. Discharge of groundwater is to nearby surface waters. The AuSable River Bayou is believed to be the primary discharge point for the contaminated groundwater.

A total of four surface water samples were collected from the AuSable River Bayou, three samples were taken downgradient of the site and one up-gradient as a background sample. Analytical parameters included full inorganics including filtered and unfiltered metals and cyanide, full organics, total dissolved and total suspended solids and nitrate/nitrite. Field parameters tested included pH and temperature, which were recorded in the field sampling log book.

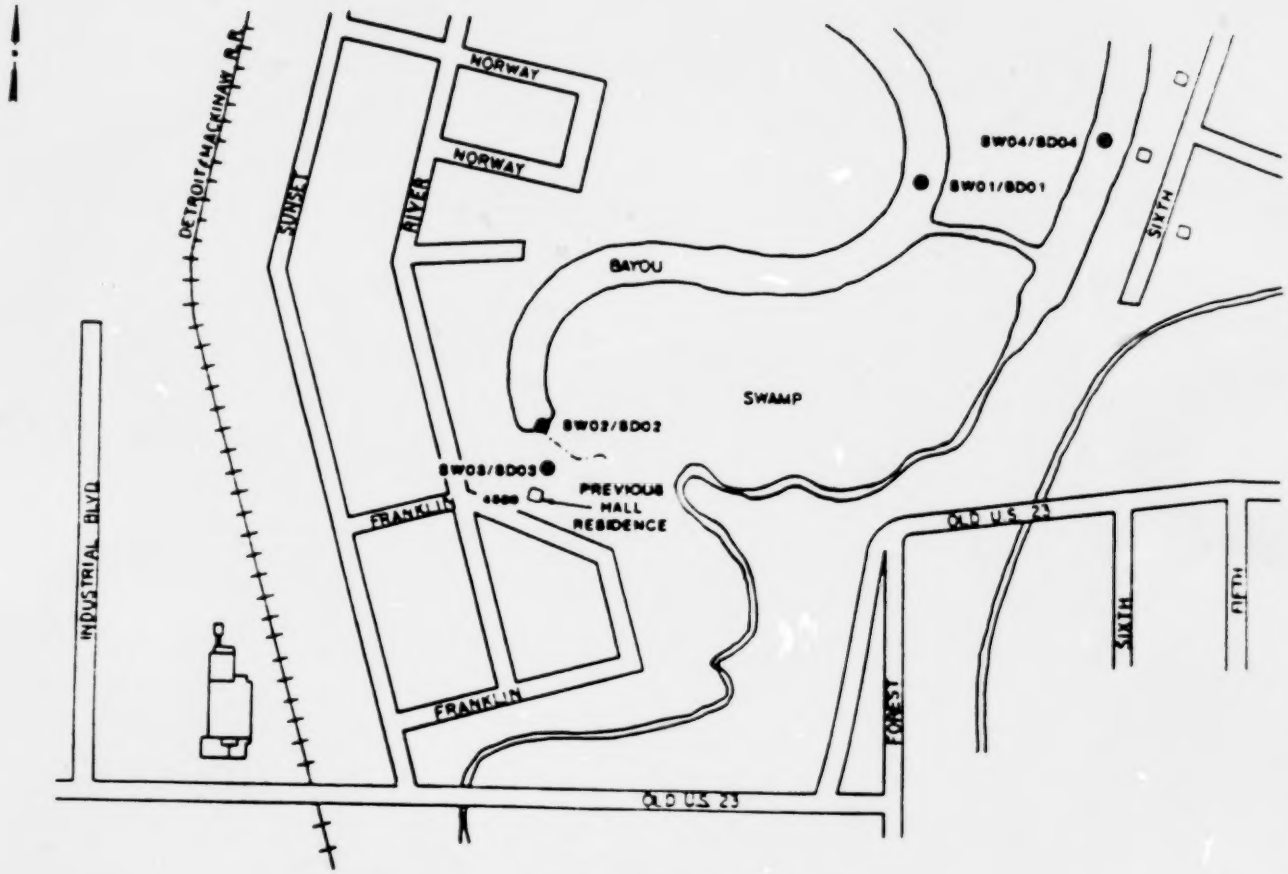
TCE appears to be discharging into the bayou. Surface water samples SW02 and SW03 show TCE, vinyl chloride, and trans-1,2 dichloroethylene in the low ppb range. The latter two compounds are suspected biodegradation products. Vinyl chloride, especially, can be found associated with TCE in reducing environments such as the swampy area of the bayou where the samples were taken.

Inorganics in the surface water are not a problem, as the sample results are within expected ranges when compared with background concentrations.

Four sediment samples were collected at the same locations where surface water samples were taken (See Figure 7). Two of the sediment samples were grab samples and two were composites taken across the width of the bayou. Analytical parameters included full organic and inorganic priority pollutant scan. Neither organics nor inorganics in the sediment are a problem.

IV. SUMMARY OF SITE RISK

As part of the RI/FS, a public health/environmental risk assessment was conducted that addressed the potential impacts to human health or the environment associated with the Hedblum Industries site in the absence of remedial action. This assessment follows U.S. EPA guidance for risk assessment in general and for Superfund sites in particular as



SURFACE WATER & SEDIMENT SAMPLE LOCATIONS

SW01/SD01 = SAMPLE NO & LOCATION

FIGURE 7

presented in: Guidelines for Estimating Exposures, Fed. Reg. 51: 34042 - 34054; Guidelines for Carcinogen Risk Assessment, Fed. Reg. 51: 33992 - 34003; Guidelines for the Health Risk Assessment of Chemical Mixtures, Fed. Reg. 51: 34014 - 34023; and, Superfund Public Health Evaluation Manual, EPA 540 1-86-060.

Chemicals of Potential Concern

The purpose of identifying chemicals of potential concern is to ensure that only those chemicals that are attributable to the site and that are likely to contribute to risk are carried through the risk assessment. However, since under U.S. EPA guidance, the toxic effect of chemicals may be considered additive, a conservative approach was adopted which retains chemicals for evaluation if there is not clear evidence of their lack of association with the site. Tables 1 through 5 list the chemicals of potential concern by media: groundwater (sampling rounds 1 and 2), soil, surface water and sediment. These tables identify the frequency of detection, the detected concentrations (mean and maximum), and background levels.

Exposure Assessment

The chemicals of potential concern have been evaluated to determine the level of risk they pose to public health and the environment. Groundwater provides different potential routes of exposure. The primary one is the ingestion of groundwater, as there are residential wells downgradient of the Hedblum Industries site. Additionally, inhalation and dermal exposures to contaminants may occur through daily use of water for activities such as cooking, bathing, showering, and washing of dishes and clothes. Exposure pathways considered to have a low potential for substantial exposure include: direct contact and inhalation from watering lawns, gardens, or washing cars as the exposure is periodic and of short duration; and, uptake by vegetables with subsequent ingestion by humans, as contaminants are expected to volatilize during sprinkling and soil accumulation will be minimal.

Potential routes of exposure through the soils include direct contact with dermal absorption and incidental ingestion. Not only are workers at the plant on-site potential receptors but trespassers also, since the site is not fenced. More soil investigation needs to be conducted to better determine the contamination concentrations.

Air exposures can occur through the inhalation of dust or vapors. Exposure of on-site workers and trespassers is not considered significant because the coarse grained soil at the site will not easily be entrained by the wind, and air monitoring during RI activities did not detect organic vapor during non-intrusive activities. There is potential exposure of residents to air contaminants from groundwater seeps on the banks of the bayou downgradient from the site.

TABLE 1 - Chemicals of Potential Concern in Groundwater Sample (Round 1)

Chemical	Frequency of Detection	Concentration mean (ug/L)	max (ug/L)	Background (ug/l)
ORGANIC				
Methylene Chloride	2/32	2.1	6.7	< 5
Acetone	1/32	3.6	104	<10
1,1-Dichloroethene	1/32	2.6	14	< 5
1,1-Dichloroethane	3/32	2.5	20	< 5
Trans-1,2-Dichloroethene	1/32	2.7	16.5	< 5
1,1,1-Trichlorethane	5/32	3.0	3080	< 5
Carbon Tetrachloride	1/32	2.9	423	< 5
Trichloroethene	16/32	7.4	4880	< 5
Tetrachloroethene	5/32	3.0	58	< 5
Toluene	4/32	2.6	125	< 5
Xylenes	4/32	2.3	50	< 5
Bis(2-Ethylhexyl) Phthalate	17/32	3.5	14	3
INORGANIC (filtered)				
Aluminum	12/32	98.3	400	<200
Lead	13/32	2.5	381	< 1
Mercury	2/32	0.1	3.9	<0.2
Zinc	21/32	100	24,870	< 10
INORGANIC (unfiltered)				
Aluminum	8/20	112	862	97
Iron	20/20	385	13,100	224
Zinc	12/20	150	24,300	<10

TABLE 2 - Chemicals of Potential Concern in Groundwater Samples (ROUND 2)

Chemical	Frequency of Detection	Concentration mean (ug/L)	max (ug/L)	Background (ug/L)
ORGANIC				
Methylene Chloride	1/23	2.4	330	< 5
Acetone	3/23	9.3	610	1500
1,1-Dichloroethene	1/23	2.8	32	< 5
1,1-Dichloroethane	1/23	2.6	5.7	< 5
Trans-1,2-Dichloroethene	2/23	2.3	6.7	< 5
Chloroform	1/23	-	0.13	< 5
1,1,1-Trichloroethane	4/23	3.9	2100	< 5
Trichloroethene	11/23	8.5	340	< 5
Benzene	3/23	2.5	29	< 5
Tetrachloroethene	3/23	2.3	13	< 5
Toluene	12/23	3.2	9	< 5
Di-n-Butyl Phthalate	1/23	1.1	16	< 2
Bis(2-Ethylhexyl) Phthalate	4/23	2.9	15	4
METALS (filtered)				
Aluminum	14/23	151	2530	45
Lead	17/23	7.6	210	5.5
Zinc	23/23	334	27,100	43

TABLE 3 - Chemicals of Potential Concern in Shallow Soil Samples

Chemical	Frequency of Detection	Concentration mean (ug/L)	max (ug/L)	Background Range (ug/L)
ORGANIC				
Methylene Chloride	4/18	-	11.5	< 5-4
Acetone	4/18	6.3	87	<10-5
Chloroform	4/18	2.6	3.9	< 5
Trichloroethene	5/18	3.7	21	< 5
Tetrachloroethene	5/18	3.3	29	< 5
Toluene	6/18	2.9	7.5	< 5-9
Xylenes	5/18	3.6	15.5	< 5-52
Di-n-Butyl Phthalate	6/18	155	190	< 330-147
Bis (2-Ethylhexyl) Phthalate	3/18	292	1692	< 330

Note: No analyses were made for deep soil samples (greater or equal to 15 feet deep) because of unlikely direct contact with these soils by human or animals.

TABLE 4 - Chemicals of Potential Concern in Surface Water Samples

Chemicals	Frequency of Detection	Concentration mean (ug/L)	max (ug/L)	Background (ug/L)
ORGANIC				
Vinyl Chloride	2/3	6.9	14	<10
Trans-1,2-Dichloroethene	2/3	14.2	91	< 5
Trichloroethene	2/3	15.1	67	< 5
Di-N-Butyl Phthalate	3/3	4.4	5.3	4J

J-estimate

TABLE 5 - Chemicals of Potential Concern in Sediment Samples

Chemical	Frequency of Detection	Concentration mean (ug/L)	max (ug/L)	Background (ug/L)
ORGANIC				
Acetone	3/3	75.3	250	129
Trans-1,2-Dichloroethene	1/3	2.9	4	< 5
Toluene	1/3	3.5	7	5.5
Di-n-Butyl Phthalate	3/3	530	890	327

Surface water and sediment exposure is confined to the bayou. Potential exposure is through dermal absorption and incidental ingestion while swimming and contaminant uptake via fish consumption.

Toxicity Assessment

For risk assessment purposes, individual pollutants are separated into two categories of chemical toxicity depending on whether they exhibit noncarcinogenic or carcinogenic effects.

Health criteria for chemicals exhibiting noncarcinogenic effects are generally developed using reference doses (RfDs) developed by the U.S. EPA RfD Work Group or RfDs obtained from Health Effects Assessments. The RfD, expressed in units of mg/kg/day, is an estimate of the daily exposure to the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime.

Cancer potency factors, developed by the U.S. EPA's Carcinogen Assessment Group for potentially carcinogenic chemicals, expressed in units of $(mg/kg/day)^{-1}$, are derived from the results of human epidemiological studies or chronic animal bioassays.

Table 6 and 7 present the health effects criteria values for site - related chemicals in the groundwater and surface water.

Summary of Risk Characterization

To quantitatively assess the potential risks to human health associated with the current exposure scenarios, the concentrations of chemicals present in relevant environmental media at potential exposure concentrations are converted to chronic daily intakes (CDIs). CDIs are expressed as the amount of a substance taken into the body per unit body weight, per unit time or mg/kg/day. For potential carcinogens, excess lifetime cancer risks are obtained by multiplying the CDI by its cancer potency factor. U.S. EPA has implemented actions under Superfund which after remediation leave a total cancer risk ranging from 1×10^{-4} to 1×10^{-7}, i.e., the probability of one excess cancer is one in 10,000 or 10,000,000, respectively, under the conditions of exposure. A risk level of 1×10^{-6}, representing a probability of one in 1,000,000 people contracting cancer due to exposure to the potential carcinogen, is used as a point of departure for establishing the criteria for remediating a site.

Potential risks for noncarcinogens are presented as the ratio of the CDI exposure to the RfD (CDI:RfD). The sum of all the ratios of chemicals under consideration is called the hazard index. This

TABLE 6

HEALTH EFFECTS CRITERIA FOR ORAL EXPOSURE TO CHEMICALS OF CONCERN

Chemical	Reference Dose (RfD) (mg/kg/day)	Uncertainty Factor (a)	RfD Source (b)	EPA/CAG Cancer Potency Factor (mg/kg/day)-1	Weight of Evidence (c)
Acetone	1E-1	1,000	IRIS	---	---
Benzene	---*	---	IRIS	2.9E-2	A
Bis(2-ethylhexyl)phthalate	2E-2	1,000	IRIS	1.4E-2	B2
Carbon tetrachloride	7E-4	1,000	IRIS	1.3E-1	B2
Chloroform	1E-2	1,000	IRIS	6.1E-3	B2
1,1-Dichloroethane	---	---	---	9.1E-2	C
1,1-Dichloroethene	9E-3	1,000	IRIS	0.6	C
trans-1,2-Dichloroethene	1E-2	1,000	HA	---	---
Di-n-butyl phthalate	1E-1	1,000	IRIS	---	---
Methylene chloride	6E-2	100	IRIS	7.5E-3	B2
Tetrachloroethylene	1E-2	1,000	IRIS	5.1E-2*	B2
Toluene	3E-1	100	IRIS	---	---
1,1,1-Trichloroethane	9E-2	1,000	IRIS	---	---
Trichloroethene	7.4E-3*	1,000	HA	1.1E-2	B2
Vinyl Chloride	---	---	---	2.3	A
Xylenes (mixed	2	100	IRIS	---	---
Aluminum	---	---	---	---	---
Barium	5E-2	100	IRIS	---	---
Cadmium	5E-4*	10	HA	---	---
Cyanide	2E-2	100	IRIS	---	---
Iron	---	---	---	---	C
Lead	6E-4 (d)	---	---	---	B2
Mercury	2E-3	1000	HEA	---	---
Zinc	2E-1	10	HEA	---	---

a Uncertainty factors used to develop reference doses consist of multiples of 10, each factor representing a specific area of uncertainty inherent in the data available. The standard uncertainty factors include
A 10-fold factor to account for the variation in sensitivity among the members of the human population.
A 10-fold factor to account for the uncertainty in extrapolating animal data to the case of humans.
A 10-fold factor to account for uncertainty in extrapolating from less than chronic NOAELs to chronic NOAELs and
A 10-fold factor to account for the uncertainty in extrapolating from LOAELs to NOAELs

b Reference Dose (RfD) Sources (1) IRIS = Environmental Protection Agency (EPA) 1988 Integrated Risk Information System (IRIS). Environmental Criteria and Assessment Office, Cincinnati, Ohio. (2) HA = Environmental Protection Agency (EPA) 1987 Health Advisories (HA). Office of Drinking Water, Washington, D.C., March 31, 1987 (3) HEA = Environmental Protection Agency (EPA) 1988 June Quarterly Update for HEA and HHED Chemicals Environmental Criteria and Assessment Office, Cincinnati, Ohio July 15, 1988

c Weight of evidence classification scheme for carcinogens A--Human Carcinogen, sufficient evidence from human epidemiological studies. B1--Probable Human Carcinogen, limited evidence from epidemiological studies and adequate evidence from animal studies. B2--Probable Human Carcinogen, inadequate evidence from epidemiological studies and adequate evidence from animal studies. C--Possible Human Carcinogen, limited evidence in animals in the absence of human data. D--Not Classified as to human carcinogenicity, and E--Evidence of Noncarcinogenicity

d Reference Dose for lead is based on the old proposed MCLG

* Review pending

--- No criteria available

TABLE 7

HEALTH EFFECTS CRITERIA FOR INHALATION EXPOSURE TO CHEMICALS OF CONCERN

Chemical	Reference Dose (RfD) (mg/kg/day)	Uncertainty Factor (a)	RfD Source (b)	EPA/CAG Cancer Potency Factor (mg/kg/day)-1	Weight of Evidence (c)
Acetone	---	---	---	---	---
Benzene	---	---	---	2.9E-2	A
Bis(2-ethylhexyl)phthalate	---	---	---	---	---
Carbon tetrachloride	---	---	---	1.3E-1	B2
Chloroform	---	---	---	8.1E-2	B2
1,1-Dichloroethane	---	---	---	---	---
1,1-Dichloroethene	---	---	---	1.2	C
trans-1,2-Dichloroethene	---	---	---	---	---
Di-n-butyl phthalate	---	---	---	---	---
Methylene chloride	---	---	---	1.6E-2	B2
Tetrachloroethylene	---	---	---	3.3E-3*	B2
Toluene	1	100	HEA	---	---
1,1,1-Trichloroethane	3E-1	1,000	HEA	---	---
Trichloroethene	---	---	---	4.6E-3	B2
Vinyl Chloride	---	---	---	2.95E-1	A
Xylenes (mixed)	4E-1	1,000	HEA	---	---
Aluminum	---	---	---	---	---
Barium	1E-4	1,000	HEA	---	---
Cadmium	---	---	---	6.1	B1
Cyanide	---	---	---	---	---
Iron	---	---	---	---	C
Lead	---	---	---	---	B2
Mercury	---	---	---	---	---
Zinc	---	---	---	---	---

(a) Uncertainty factors used to develop reference doses consist of multiples of 10, each factor representing a specific area of uncertainty inherent in the data available. The standard uncertainty factors include:
- A 10-fold factor to account for the variation in sensitivity among the members of the human population;
- A 10-fold factor to account for the uncertainty in extrapolating animal data to the case of humans;
- A 10-fold factor to account for uncertainty in extrapolating from less than chronic NOAELs to chronic NOAELs; and;
- A 10-fold factor to account for the uncertainty in extrapolating from LOAELs to NOAELs.

(b) Reference Dose (RfD) Source: HEA = Environmental Protection Agency (EPA). 1988. June Quarterly Update for HEA and HEED Chemicals. Environmental Criteria and Assessment Office. Cincinnati, Ohio. July 15, 1988.

(c) Weight of evidence classification scheme for carcinogens: A--Human Carcinogen, sufficient evidence from human epidemiological studies; B1--Probable Human Carcinogen, limited evidence from epidemiological studies and adequate evidence from animal studies; B2--Probable Human Carcinogen, inadequate evidence from epidemiological studies and adequate evidence from animal studies; C--Possible Human Carcinogen, limited evidence in animals in the absence of human data; D--Not Classified as to human carcinogenicity; and E--Evidence of Noncarcinogenicity.

* = Review pending.

--- = No criteria available.

hazard index is useful as a reference point for gauging the potential effects of environmental exposures to complex mixtures. In general, hazard indices which are less than one are not likely to be associated with any health risks. However, all hazard indices less than one should not be categorically considered acceptable because of the uncertainty associated with estimates of CDI and RfD.

In accordance with U.S. EPA guidelines for evaluating the potential toxicity of complex mixtures, it is assumed that the toxic effects of the site related chemicals are additive. The lifetime excess cancer risks and the CDI:RfD ratios are summed for each exposure scenario to indicate the potential risks associated with mixtures of potential carcinogens and noncarcinogens, respectively. These risk estimates are presented in Table 8 for ingestion of groundwater, Table 9 for inhalation of volatile chemicals near the groundwater seeps, and Table 10 for dermal absorption and incidental ingestion of surface water. The primary risks are associated with ingestion of volatile organics in the groundwater as both average and plausible maximum exposure scenarios result in upperbound lifetime excess cancer risks that exceed 1×10^{-6}. The plausible maximum scenario used to evaluate exposure and risk via ingestion of fish from the bayou resulted in an upperbound lifetime excess cancer risk that exceeds 1×10^{-6}. However, the risk is likely to be overestimated based on the bioconcentration factors used in estimating concentrations in fish, assumptions made regarding the persistence of measured concentrations year round and into the future, and the assumption that predicted concentrations in fish are present at the time of ingestion. It should be noted that all of the estimates of risk to human health are conservative, as they assume much more extensive contact with site contaminants than is currently occurring. Thus, the exposure and risks tend to be overestimated but are useful in determining whether to take remedial action at the Hedblum Industries site.

VII. DESCRIPTION OF ALTERNATIVES

Technologies to address contamination in each media of interest were discussed in the FS. The media included groundwater, subsurface soil, surface water and sediment. The inhalation of contaminants from the groundwater seep, i.e. via the air media, was not considered to pose unacceptable risks, so no technologies to address contamination in the air were considered. The technologies that were considered for the other media were subjected to an initial screening based on technical feasibility, protection of the public health and the environment, and cost relative to other technologies which provide comparable treatment. Technologies were assembled into remedial actions for each media of interest and screened using the aforementioned criteria. After this screening of remedial actions, six alternatives remained and were analyzed in detail. Each of these alternatives are described briefly below.

TABLE 8

ESTIMATED EXPOSURE AND RISK ASSOCIATED WITH THE INGESTION OF GROUNDWATER: CURRENT LAND-USE
NEDBLUM INDUSTRIES SITE

CHEMICALS OF POTENTIAL CONCERN	CHRONIC DAILY INTAKE (CDI) VIA INGESTION (mg/kg/day)		TOXICITY CRITERIA	COMBINED ESTIMATED RISK	
	AVERAGE	PLAUSIBLE MAXIMUM		AVERAGE	PLAUSIBLE MAXIMUM
POTENTIAL CARCINOGENS			CANCER POTENCY FACTOR (mg/kg/day)-1	UPPERBOUND LIFETIME EXCESS CANCER RISK	
Organics					
METHYLENE CHLORIDE	1.80E-05	9.43E-03	7.50E-03	1E-07	7E-05
1,1-DICHLOROETHENE	2.20E-05	9.14E-04	6.00E-01	1E-05	5E-04
1,1-DICHLOROETHANE	2.04E-05	5.71E-04	9.10E-02	2E-06	5E-05
CHLOROFORM	--	3.71E-06	6.10E-03	--	2E-08
CARBON TETRACHLORIDE	2.20E-05	1.21E-02	1.30E-01	3E-06	2E-03
TRICHLOROETHENE	4.57E-05	1.39E-01	1.10E-02	5E-07	2E-03
BENZENE	2.04E-05	8.00E-04	2.90E-02	6E-07	2E-05
TETRACHLOROETHENE	2.20E-05	1.66E-03	5.10E-02	1E-06	8E-05
BIS(2-ETHYLHEXYL) PHTHALATE	2.61E-05	4.57E-04	1.40E-02	4E-07	6E-06
			TOTAL:	2E-05	4E-03
NONCARCINOGENS			REFERENCE DOSE (RfD) (mg/kg/day)	CDI:RfD	
Organics					
METHYLENE CHLORIDE	6.29E-05	9.43E-03	6.00E-02	1E-03	2E-01
ACETONE	1.51E-04	1.72E-02	1.00E-01	2E-03	2E-01
1,1-DICHLOROETHENE	7.71E-05	9.14E-04	9.00E-03	9E-03	1E-01
TRANS-1,2-DICHLOROETHENE	7.14E-05	4.71E-04	2.00E-02	4E-03	2E-02
CHLOROFORM	6.86E-05	3.71E-06	1.00E-02	7E-03	4E-04
1,1,1-TRICHLOROETHANE	9.43E-05	8.80E-02	9.00E-02	1E-03	1E+00
CARBON TETRACHLORIDE	7.71E-05	1.21E-02	7.00E-04	1E-01	2E+01
TRICHLOROETHENE	1.60E-04	1.39E-01	7.40E-03	2E-02	2E+01
TETRACHLOROETHENE	7.71E-05	1.66E-03	1.00E-02	8E-03	2E-01
TOLUENE	8.00E-05	3.57E-03	3.00E-01	3E-04	1E-02
XYLENES	6.86E-05	1.43E-03	2.00E+00	3E-05	7E-04
BIS(2-ETHYLHEXYL) PHTHALATE	9.14E-05	4.57E-04	2.00E-02	5E-03	2E-02
DI-N-BUTYL PHTHALATE	8.29E-05	1.31E-03	1.00E-01	8E-04	1E-02
Inorganics (filtered)					
MERCURY	3.48E-06	1.11E-04	2.00E-03	2E-03	6E-02
ZINC	4.73E-03	7.74E-01	2.00E-01	2E-02	4E+00
LEAD	1.14E-04	1.09E-02	6.00E-04	2E-01	2E+01
		TOTAL (organics and filtered inorganics):		4E-01	6E+01
Inorganics (unfiltered)					
ZINC	3.49E-03	6.94E-01	2.00E-01	2E-02	3E+00
		TOTAL (organics and unfiltered inorganics)		2E-01	4E+01

TABLE 9

ESTIMATED EXPOSURE AND RISK ASSOCIATED WITH EXPOSURE OF CURRENT RESIDENTS TO CONTAMINANTS VOLATILIZED FROM THE GROUNDWATER SEEP CURRENT LAND-USE/HEDBLUM INDUSTRIES, MICHIGAN

CHEMICAL	CHRONIC DAILY INTAKE (CDI) VIA INHALATION (mg/kg/day)		TOXICITY CRITERIA	COMBINED ESTIMATED RISK	
	AVERAGE	PLAUSIBLE MAXIMUM		AVERAGE	PLAUSIBLE MAXIMUM
POTENTIAL CARCINOGENS			CANCER POTENCY FACTOR (mg/kg/day)-1	UPPERBOUND LIFETIME EXCESS CANCER RISK	
Organics					
VINYL CHLORIDE	3.70E-07	3.98E-06	2.95E-01	1E-07	1E-06
TRICHLOROETHENE	1.14E-06	1.23E-05	4.6E-03	5E-09	6E-08
			TOTAL:	1E-07	1E-06
NONCARCINOGENS			REFERENCE DOSE (RfD) (mg/kg/day)	CDI:RfD	
Organics					
TRANS-1,2-DICHLOROETHENE	4.16E-06	1.28E-05	2.0E-02 (a)	2E-04	6E-04
TRICHLOROETHENE	4.00E-06	1.23E-05	7.4E-03 (a)	5E-04	2E-03
DI-N-BUTYL PHTHALATE	3.96E-10	1.22E-09	1.0E-01 (a)	4E-09	1E-08
			TOTAL:	7E-04	2E-03

(a) No cancer potency factor or RfD available for inhalation exposure; oral criteria have been used

TABLE 10

ESTIMATED EXPOSURE AND RISK ASSOCIATED WITH EXPOSURE OF SWIMMERS IN THE BAYOU
TO CONTAMINATED SURFACE WATER
THROUGH DERMAL ABSORPTION AND INCIDENTAL INGESTION
CURRENT LAND-USE/HEDBLUM INDUSTRIES, MICHIGAN

CHEMICAL	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		TOXICITY CRITERIA	COMBINED ESTIMATED RISK	
	AVERAGE	PLAUSIBLE MAXIMUM	AVERAGE	PLAUSIBLE MAXIMUM		AVERAGE	PLAUS MAXI
POTENTIAL CARCINOGENS							
Organics					CANCER POTENCY FACTOR (mg/kg/day)-1	UPPERBOUND LIFET EXCESS CANCER RISK	
VINYL CHLORIDE	8.56E-10	1.67E-08	2.06E-08	1.67E-07	2.3	5E-08	4E
TRICHLOROETHENE	3.23E-09	1.38E-07	4.52E-08	8.01E-07	1.1E-02	5E-10	1E
					TOTAL	5E-08	4E
NONCARCINOGENS							
Organics					REFERENCE DOSE (RfD) (mg/kg/day)	CDI/RfD	
TRANS-1,2-DICHLOROETHENE	2.66E-08	1.64E-06	4.23E-07	1.09E-05	1.0E-02	5E-05	1E
TRICHLOROETHENE	3.23E-08	1.38E-06	4.52E-07	8.01E-06	7.4E-03	7E-05	1E
DI-N-BUTYL PHTHALATE	6.34E-07	7.35E-06	1.31E-07	6.34E-07	1.0E-01	8E-06	8E
					TOTAL	1E-04	3E

Alternative 1 - Site Monitoring

Capital Cost:	$ 60,400
Annual O&M Cost:	$ 6,000
Total Present Worth Cost:	$132,400

Alternative 1 provides for the continued monitoring of conditions at the site. No action to remediate contamination in any of the media is included. This alternative involves: 1) abandoning six of seven MDNR monitoring wells currently located at the site (saving the triple well nest near the northeast corner of the plant for continued monitoring); 2) installing one additional well nest at the southeast corner of the subdivision to monitor for contaminant plume migration in this direction; 3) performing quarterly groundwater monitoring for the first year and semi-annually thereafter for an additional 29 years; 4) performing additional monitoring of subsurface soils at the site in both the saturated and unsaturated zones to further define the magnitude and extent of contamination; and, 5) performing a site evaluation every five years for a 30 year period to determine if site conditions are changing and if so, evaluate what actions are needed to address these changes.

Alternative 2 - Connect to Oscoda Water Main

Capital Cost:	$ 98,300
Annual O&M Cost:	$ 6,000
Total resent Worth Cost:	$170,000
Time to Implement:	1 - 2 months

Alternative 2 provides the residents in the subdivision, currently using groundwater as their potable water supply, with an uncontaminated source of potable water. Because no action will be taken to remediate contamination, continued site monitoring will be required. This alternative involves: 1) connecting all residents in affected areas of AuSable Heights subdivision (along Franklin and River Roads), who are not currently connected, to the Oscoda municipal water main; 2) abandoning six of seven MDNR monitoring wells on the site (saving the triple well nest near the northeast corner of the plant for continued monitoring); 3) installing one additional well nest at the southeast corner of the subdivision to monitor for contaminant plume migration in this direction; 4) performing quarterly monitoring of groundwater quality the first year and semi-annually thereafter for 29 additional years; 5) performing additional subsurface soils investigation to further define the magnitude and extent of contamination; and, 6) performing a site evaluation every five years for a period of 30 years to determine if the site conditions change and if so, evaluate what actions are needed to address these changes.

Alternative 3 - Pump and Treat Contaminated Groundwater

Capital Cost:	$ 434,000
Annual O&M Cost	$ 264,000
Total Present Worth Cost:	$1,379,000
Time to Implement:	4 - 5 years

Alternative 3 treats contaminated groundwater in the aquifer under the site to reduce the levels of volatile organic compounds (VOCs). This alternative includes: 1) installing an extraction well system in the AuSable Heights subdivision and an extraction well on the site property downgradient of the plant; 2) pumping extracted water to the site for treatment to MCLs using activated carbon; 3) discharging effluent water from the treatment process to the bayou; 4) monitoring groundwater at the subdivision during the treatment process; 5) abandoning six of seven MDNR monitoring wells on the site (saving the triple well nest near the northeast corner of the plant for continued monitoring); and, 6) performing additional monitoring of subsurface soil at the site in both the saturated and unsaturated zones to further define the magnitude and extent of contamination.

Alternative 4 - Excavate and Treat Contaminated Soils

Capital Cost:	$652,800
Annual O&M Cost:	$ 6,000
Total Present Worth Cost:	$724,800
Time to Implement:	3-6 months

Alternative 4 excavates and treats contaminated subsurface soils located on-site using a mobile on-site thermal volatilization treatment system. Because contaminated groundwater will be left in the aquifer, continued monitoring will be required. This alternative involves: 1) excavating contaminated subsurface soils on-site to an approximate depth of 35 feet using conventional excavation techniques; 2) treating contaminated soils on site with a thermal volatilization treatment system and backfilling the excavated pit with treated soils; 3) treating groundwater pumped from the pit during excavation on site with activated carbon and discharging to the bayou; 4) abandoning six of seven MDNR monitoring wells on site (saving the triple well nest near the northeast corner of the plant); 5) installing one additional well nest at the southeast corner of the subdivision to monitor for contaminant plume migration in this direction; 6) performing quarterly monitoring of groundwater quality in the aquifer the first year and semi-annually thereafter for an additional 29 years; 7) performing additional monitoring subsurface soils at the site in the unsaturated zone to further define the magnitude and extent of contamination; and 8) performing a site evaluation every five years for a period of 30 years.

Alternative 5 - Pump and Treat Contaminated Groundwater, Excavate and Treat Contaminated Soils

Capital Cost:	$ 969,000
Annual O&M Cost:	$ 264,000
Total Present Worth Cost:	$1,914,200
Time to Implement:	4-5 years

Alternative 5 includes actions to address the contaminated groundwater and contaminated soils. This alternative involves: 1) installing an extraction well system in the AuSable Heights subdivision and an extraction well on the site downgradient from the plant; 2) pumping extracted water to the site for treatment to the MCLs using activated carbon; 3) discharging effluent water from the treatment process to the bayou; 4) monitoring groundwater quality at the subdivision during the treatment process and quarterly for one year after site closure; 5) abandoning six of seven MDNR monitoring wells on site (saving the triple well nest the northeast corner of the building); 6) excavating contaminated subsurface soils on site to a depth of approximately 35 feet; 7) treating contaminated soils on site using a thermal volatilization treatment unit and backfilling the excavated pit with treated soils; 8) treating groundwater pumped from the excavated pit using activated carbon; 9) performing quarterly groundwater monitoring from eleven monitoring wells on site and in the subdivision during the first year after site closure; and, 10) monitoring subsurface soils at the site in the unsaturated zone to further define the magnitude and extent of contamination.

Alternative 6 - No Action

Capital cost:	$0
Annual O&M Cost:	$0
Total Present Worth Cost:	$0
Time to Implement:	none

Alternative 6 is the no action alternative. Under this alternative, no actions to remediate environmental contamination at the site or in the subdivision will be performed. All monitoring and residential wells will be left as is, no monitoring will be performed.

VIII. COMPARATIVE ANALYSIS OF ALTERNATIVES

A detailed analysis was performed on the six alternatives using the nine evaluation criteria in order to select a site remedy. The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria. These nine criteria are: 1) overall protection of human health and the environment, 2) compliance with applicable or relevant and appropriate requirements (ARARs), 3) short-term effectiveness, 4) long-term effectiveness and

permanence, 5) cost, 6) reduction of toxicity, mobility and volume, 7) implementability, 8) State acceptance, and 9) community acceptance.

Overall Protection of Public Health and the Environment

Evaluation of the overall protectiveness of each alternative focuses on how the alternative achieves protection over time and how the risks are eliminated, reduced and controlled through treatment, engineering controls or institutional controls. Alternative 5, which treats contamination in the groundwater and soils would provide the highest degree of protection to the public health and the environment. Pumping and treating contaminated groundwater should reduce the levels of VOC contamination in the aquifer to those required by Michigan Act 399 of 1976. Excavating and treating contaminated soils on-site will remove this possible source of groundwater contamination though exposure to this source was not positively identified as a potential health risk in the public health assessment. Alternative 3 treats the contaminated groundwater as in Alternative 5, to levels required by Act 399 of 1976 and is protective of public health and the environment. Alternative 4 treats the contaminated on-site soils but since the residential wells directly east of the site do not show elevated levels of VOC and indicate that the soils are not an on-going source of contamination, this alternative will have minimal protective effect on human health. Alternative 2 will eliminate ingestion of and incidental contact with contaminated groundwater for those residents connected to the water main but it does not treat contamination in the environment and therefore is not protective of future well users or the environment. Alternatives 1 and 6 are not protective of public health and the environment because they do not treat contamination in the environment.

Compliance with ARARs

Each alternative is evaluated for compliance with ARARs, including chemical-specific, action-specific and location specific ARARs. These ARARs are presented in Table 11 with the alternatives to which they apply. All of the alternatives, except the no action alternative, will meet their respective ARARs with the following exception: Alternatives 1, 2, and 4 do not comply with the Safe Drinking Water Act of 1987 and Act 399 of 1976 which set primary drinking water standards.

Short-Term Effectiveness

This evaluation focuses on the effects on human health and the environment which may occur while the alternative is being implemented and until the remedial objectives are met. The following

TABLE 11

COMPLIANCE WITH APPLICABLE OR RELEVANT AND
APPROPRIATE REQUIREMENTS
AT THE NEDBLUM INDUSTRIES SITE

REGULATION, POLICY OR LAW	APPLICABILITY	RESPONSE	ALTERNATIVES 1	2	3	4	5	6
Chemical-Specific ARARs								
Safe Water Drinking Act of 1987	Supplying potable water	Sets primary drinking water standards TCE 5ppb TCA 200 ppb	-	-	X	-	X	-
Act 399 of 1976 (Safe Drinking Water Act)	Potable water, groundwater	Establish MCLs for drinking water in Michigan	-	-	X	-	X	-
Action-Specific ARARs								
Federal Requirements								
Clean Water Act	Regulates discharge of water into rivers	State of Michigan has jurisdiction over issuance of NPDES permits	NA	NA	X	X	X	NA

1
X: In compliance with ARAR
- Not in compliance with ARAR
NA Not applicable

TABLE 11 (Continued)

COMPLIANCE WITH APPLICABLE OR RELEVANT AND
APPROPRIATE REQUIREMENTS
AT THE NEDBLUM INDUSTRIES SITE

REGULATION, POLICY OR LAW	APPLICABILITY	RESPONSE	1	2	3	4	5	6
Resource Conservation and Recovery Act (RCRA)	Closure of hazardous waste facilities	Requires groundwater monitoring after closure	X	NA	NA	X	X	-
40 CFR 264.114	Closure of hazardous waste facilities	Requires equipment to be decontaminated or disposed upon facility closure	NA	NA	NA	X	X	-
State Requirements								
Act 64 of 1979 Part 2	Contaminated soils	Requires identification of hazardous wastes	X	NA	NA	X	X	-
Act 245 of 1929 Rule 57	Contaminated soils	Prohibits the presence of toxic substances at levels which may be injurious to the public health	NA	NA	X	X	X	NA

TABLE 11 (Continued)

COMPLIANCE WITH APPLICABLE OR RELEVANT AND
APPROPRIATE REQUIREMENTS
AT THE NEDBLUM INDUSTRIES SITE

REGULATION, POLICY OR LAW	APPLICABILITY	RESPONSE	1	2	3	4	5	6
Act 245 Part 9	Contaminated groundwater	Maintain quality groundwater in usable aquifers, defines the requirements for hydrogeologic study and groundwater monitoring	X	X	X	X	X	-
Act 315 of 1968 Act 368 of 1978	Contaminated water, potable water supply	Requires proper abandonment of all groundwater monitoring wells	X	X	X	X	X	-
Act 245 Part 21	Requires NPDES permit for waste effluent into waters of the state		NA	X	X	X	X	NA
	Requires reporting of wastewater discharging into waters of the state		NA	X	X	X	X	NA

TABLE 11 (Continued)

COMPLIANCE WITH APPLICABLE OR RELEVANT AND
APPROPRIATE REQUIREMENTS
AT THE NEDBLUM INDUSTRIES SITE

REGULATION, POLICY OR LAW	APPLICABILITY	RESPONSE	ALTERNATIVES					
			1	2	3	4	5	6
Act 98 of 1913 (Waterworks and Sewerage System Act)	Contaminated groundwater and soils treatment	Provides for supervision and control over discharge of industrial liquid wastes	NA	NA	X	X	X	NA
Act 399 of 1976 (Safe Drinking Water Act)	Supplying potable water	Establish MCLs for organic chemicals	-	-	X	-	X	-
Act 348 of 1965 (The Air Pollution)	Contaminated soils on-site treatment	Controls emission air contaminants to safe levels, requires air monitoring	NA	NA	NA	X	X	NA
Act 347 of 1972 (Soil Erosion and Sedimentation Act)	Contaminated soils excavation and treatment	Soil erosion and sedimentation	NA	NA	NA	X	X	NA

TABLE 11 (Continued)

COMPLIANCE WITH APPLICABLE OR RELEVANT AND
APPROPRIATE REQUIREMENTS
AT THE NEDBLUM INDUSTRIES SITE

REGULATION, POLICY OR LAW	APPLICABILITY	RESPONSE	1	2	3	4	5	6
Act 64 of 1979 (The Hazardous Waste Management Act)	Contaminated soils and groundwater treatment	Requires permits for hazardous waste treatment, storage or disposal facilities	NA	NA	NA	X	X	NA
		Incinerator Performance Standards	NA	NA	NA	X	X	NA
Act 345 of 1965 (Air Pollution Act)	Contaminated soils Treatment	Requires permit to construct or relocate equipment which may create air pollution	NA	NA	NA	X	X	NA
		Specifies information and data to be included in application for permit.	NA	NA	NA	X	X	NA
Act 345 of 1965 Rule 901	Contaminated soils treatment	Controls emissions of air contaminants which may cause injury to human health and the environment or property	NA	NA	NA	X	X	NA

TABLE 11 (Continued)

COMPLIANCE WITH APPLICABLE OR RELEVANT
APPROPRIATE REQUIREM
AT THE NEDBLUM INDUSTRIES SITE

REGULATION, POLICY OR LAW	APPLICABILITY	RESPONSE	ALTERNATIVES 1	2	3	4	5	6
Location-Specific ARARs								
Act 203 of 1979 (The Goemaere-Anderson Wetland Protection Act)	Contaminated groundwater and soils treatment	Requires permit to construct in a wetland. Specifies technical information for permit.	NA	NA	X	X	X	NA
Act 346 of 1972 (Inland Lakes and Streams Act of 1972)	Contaminated groundwater and soils treatment	Requires permit to construct surface water discharge piping to inland lakes and streams. Specifies technical information for permit.	NA	NA	X	X	X	NA

1

X: In compliance with ARAR
-: Not in compliance with ARAR
NA: Not applicable

factors were used to evaluate the short-term effectiveness of each alternative: protection of the community during remedial actions, protection of workers during remedial actions, environmental impacts from implementation of alternatives, and time until remedial objectives are met.

With respect to protection of the community, Alternatives 1 through 5 will not pose risks to the local community, though there may be temporary inconveniences. Alternatives 4 and 5 which involve excavation may result in increased dust generation but this can be controlled through conventional dust suppression techniques.

Risks to workers during remedial action in Alternatives 1 through 5 can be controlled with safe working practices. Alternatives 4 and 5 may expose workers to VOCs from excavated soils but the levels should be within applicable PELs and TLVs.

With respect to environmental impacts, Alternatives 1, 2, 3, and 6 will have continued migration of contaminated groundwater at the site and under the subdivision as they do not address groundwater contamination. Alternatives 3, 4, and 5 will result in a temporary change in groundwater flow from extraction and pit dewatering and a temporary increase in the flow rate in the bayou from the discharged groundwater. Alternatives 4 and 5 could result in the release of low levels of VOC to the air from the soils excavation.

Evaluation of the time until protection is achieved reveals the following estimates: Alternative 2 should take a few weeks to a few months, Alternative 4 should take 5-6 months, and Alternatives 3 and 5 should take 4-5 years. Alternatives 1 and 6 will not achieve protection.

Long - Term Effectiveness and Permanence

This evaluation focuses on the results of a remedial action in terms of the risk remaining at the site after response objectives have been met. The following factors are addressed for each alternative: magnitude of remaining risk, adequacy and reliability of controls.

The primary risk identified at the site by the public health/environmental risk assessment is from the ingestion of contaminated groundwater. Alternatives 3 and 5 offer the greatest degree of permanence as they minimize the risks from ingestion of and incidental contact with contaminated groundwater by removing the contaminants with treatment. Alternative 5 also treats subsurface soils on-site. However, the soils were not found to pose an unacceptable risk. Alternative 2 eliminates the risks from ingestion and incidental contact with contaminated groundwater by supplying

residents connected to the water main with a clean source of potable water. However, the contaminated groundwater would still persist with this alternative. Alternative 4 reduces the risks from contact with subsurface soils but also does not address the contamination of the groundwater. Alternatives 1 and 6 will not mitigate any of the risks presently associated with the site.

With respect to adequacy and reliability of controls, Alternatives 3 and 5 both use a reliable method to reduce and possibly eliminate groundwater contamination. Total elimination of VOC contamination will depend on its distribution in the aquifer. If the system components mechanically fail, they may be replaced or repaired without much impact on the residences. The excavation and treatment of on-site soils in Alternatives 4 and 5 should remove this possible source of groundwater contamination. If the excavation or treatment system mechanically fail, they may be replaced or repaired with no exposure of the local community to contaminants. Alternative 2 uses connections to the water main to eliminate risks from groundwater which has a low potential for failure.

Cost

This evaluation examines the estimated costs for implementing the remedial alternatives. Capital and annual O&M costs are used to calculate estimated present worth costs for each alternative. Alternative 3, pumping and treating contaminated groundwater, has a moderate capital cost and high annual cost which results in an estimated present worth of $1,379,000. Alternative 4, excavating and treating on-site soils has a high capital cost but since there is a short implementation time, annual costs are low. This results in an estimated present worth cost of $724,800. Alternative 5, which combines Alternatives 3 and 4, has the highest capital and annual cost. Estimated present worth costs total $1,914,000 for Alternative 5. The remaining 3 alternatives which provide less overall protection of public health and the environment cost less than the already mentioned alternatives. Alternative 6, no action, is considered to have no associated costs. Alternative 1, continued monitoring at the site and subdivision, has low capital and annual costs. The estimated present worth costs is $132,400. Alternative 2, connecting affected residents to the Oscoda water main and site monitoring, also has low capital and annual worth costs total $170,250.

Reduction of Toxicity , Mobility and Volume

This evaluation addresses the statutory preference for selecting remedial actions that employ treatment technologies which permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances. This preference is satisfied when treatment is

used to reduce the principal threats at a site through destruction of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.

For Alternatives 3 and 5, the volume of contaminants in the groundwater will be irreversibly reduced by extraction and treatment. The contaminant plume mobility will be affected during treatment but any remaining residual contamination will have the same mobility once pumping and treating has stopped. Alternatives 4 and 5 will eliminate the toxicity, volume, and mobility of contaminants in the soil. However, the on-site soil contamination does not appear to be an on-going cause of groundwater contamination under the subdivision. Each of these three alternatives will treat some groundwater, extraction from the aquifer in Alternatives 3 and 5 and dewatering the excavation pit in Alternatives 4 and 5. The resulting effluent water would meet discharge criteria and will be monitored to verify this. The water treatment process will generate spent carbon that may be considered hazardous waste and must be handled accordingly (by the carbon supplier and regenerator). The other three alternatives, 1, 2, and 6, provide no treatment, and thus, do nothing to affect toxicity, mobility or volume.

Implementability

This evaluation addresses the technical and administrative feasibility of implementing the alternatives and the availability of the various services and materials required during its implementation.

Technically, the placement of the extraction well system in Alternatives 3 and 5 is dependent on the location of objects and structures in the subdivision and the residents' willingness to have a well placed on their property. Otherwise, the system can be readily constructed or leased and operated. The excavation in Alternatives 4 and 5 can be accomplished with conventional techniques but this may be difficult due to the close proximity of the plant and the railroad tracks. The treatment unit can be easily constructed or leased and operated. For both the groundwater extraction and the soil treatment, a pre-design study will be needed to verify system performance. The connection to a water main in Alternative 2 is a common technology proven to be reliable. Alternative 1 only requires installing a monitoring well and Alternative 6 has no actions.

Administratively, Alternative 2 will require tap-in fees to connect to the Oscoda water main.

For all alternatives which include some type of action, all equipment, services and specialists are available locally or from national vendors.

State Acceptance

The Michigan Department of Natural Resources (MDNR) does not concur with the U.S. EPA's selection of Alternative 3 as the preferred remedial alternative for the Hedblum Industries site as presented in the next section. The MDNR agrees with the technology selected in Alternative 3, but does not agree with the targeted cleanup level for TCE. The MDNR wants a lower cleanup level for TCE, 1 ug/l, than that indicated in the preferred remedial alternative, 5 ug/l. Since the groundwater will be cleaned so as not to exceed an excess risk level of 1×10^{-6} and the groundwater will meet all maximum contaminant limits (MCLs), this remedy has been determined to be protective of human health and the environment (see Reduction of Site Risks below).

Community Acceptance

Community response to the alternatives is presented in the responsiveness summary which addresses comments received during the public comment period.

IX. SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, the detailed evaluation of the alternatives, current information, and public comments, the U.S. EPA has determined that Alternative 3: Pump and Treat Contaminated Groundwater is the most appropriate remedy for the Hedblum Industries site near Oscoda, Michigan. The major components of this remedy include:

- Installation of an extraction well system in the AuSable Heights subdivision (3 wells) and one extraction well on-site directly downgradient of the plant. Each well will extract 150 gallons per minute.

- The extracted groundwater will be pumped to the site and treated using granular activated carbon adsorption. The effluent from this treatment process will be analyzed to verify that it meets discharge limits and will be discharged to the bayou. Groundwater quality in the aquifer will be monitored during the treatment process. Spent carbon will be handled as a hazardous waste by the carbon supplier and regenerator.

- Additional subsurface soil monitoring will be performed on-site in both the saturated and unsaturated zones to further define the magnitude and extent of soil contamination and to determine if there is a need for soil remediation.

Reduction of Site Risks

The selected remedy addresses the primary risk, ingestion of contaminated groundwater, for the Hedblum Industries site as identified in the public health/environmental risk assessment. The selected remedy will pump and treat the contaminated groundwater until the chemicals of potential concern have an additive risk level of 1×10^{-6}. For those chemicals of potential concern with established MCLs, as promulgated under the Safe Drinking Water Act, these standards will be met at a minimum. The substanitve requirements of the National Pollution Discharge Elimination System (NPDES) will also be met by the discharged effluent to the bayou. MCLs for the chemicals of concern are presented in Table 12. Those affected residents with operating wells will have their wells monitored and if it is found that these wells pose a threat to public health at any time during the remediation, appropriate action will be taken to supply the residents with an alternate supply of potable water.

TABLE 12 - Maximum Contaminant Limits for Chemicals of Potential Concern

Chemical	Federal Primary Drinking Water Standards - Final MCL (ug/l)
Acetone	—
Benzene	5
Bis (2-ethylhexyl) phthalate	—
Carbon tetrachloride	5
Chloroform	100 (a)
Di-n-butyl phthalate	—
1,1-Dichloroethane	—
1,1-Dichloroethene	7
trans-1,2-Dichlorethene	—
Methylene Chloride	—
Tetrachloroethylene	—
Toluene	—
1,1,1-Trichloroethane	200
Trichloroethene	5
Vinyl Chloride	2
Xylenes (total)	—
Aluminum	—
Barium	1,000
Iron	—
Lead	50 (5 proposed)
Mercury	2
Zinc	—

— No Criteria

(a) The value of 100 ug/liter is for total trichalomethanes (i.e., the sum of chloroform, bromochloromethane, and bromoform).

Estimated Costs

The estimated capital cost for Alternative 3 is $434,000. Estimated annual costs are $264,000, with a present worth of $1,001,000 (at 10% over 5 years). Including in a salvage value for the equipment, the estimated total present worth of Alternative 3 is $1,379,000. A breakdown of these costs can be found in Table 13.

X. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Hedblum Industries site satisfies the statutory requirements of CERCLA Section 121. The selected remedy protects public health and the environment, attains ARARs, is cost effective, is a permanent solution, and reduces the volume of wastes.

Protection of Public Health and the Environment

The selected remedy protects public health and the environment through the use of activated carbon adsorption to treat contaminated groundwater to levels required by Act 399 of 1976 of the Michigan Water Resources Commission. The implementation of the remedy should not pose any short-term risks that cannot be readily controlled nor any adverse cross-media impacts. Residents with operable wells will be monitored and appropriate action to supply an alternate source of potable water will be taken in the event that contamination exists in their drinking water at unacceptable levels.

Compliance with ARARs

The selected remedy of pumping and treating the contaminated groundwater will attain ARARs. All potential ARARs for each of the alternatives were presented in Table 11 in the Comparative Analysis of the Alternatives section. The ARARs for the selected alternative are presented below.

U.S. EPA will meet the substantive requirements for all ARARs that may require permits. Permits will be secured for all activitites that are determined to be off site. The procedural requirement of obtaining a permit is not required for on-site activities pursuant to Section 121(e) of CERCLA.

FEDERAL ARARS

A. Federal Groundwater ARARs

Maximum Contaminant Levels established under the Safe Drinking Water Act are ARARs at this site. MCLs are the maximum contaminant concentrations allowed in a regulated public water supply. These levels apply at the point of distribution ("at the tap") to public water systems having at least 15 service connections or regularly serving at least 25 individuals. Levels are based on a chemical's toxicity, treatability (including cost considerations), and analytical limits of detection.

TABLE 13

ALTERNATIVE 3
PUMP AND TREAT CONTAMINATED GROUNDWATER
COST ESTIMATE

ITEM	
Capital Costs:	
Install 4 Extraction Wells	$ 18,800
Install Header and Pipes to Site	36,400
Install Pipe from Site to Bayou	17,000
2 10 ft. Carbon Units	132,000
Initial Carbon (40,000 lb.)	30,000
Installation	10,000
Construct Enclosure for Carbon Units	60,000
Abandon 6 MDNR Monitoring Wells	3,000
On-Site Soil Monitoring	26,900
Contingency (15%)	50,000
Engineering (15%)	50,000
TOTAL CAPITAL COSTS	$434,000
Annual Costs:	
Carbon Replacement	$190,000
Labor	2,000
Monitoring and Sample Analyses (treatment effluent)	10,000
Maintenance	10,300
Enclosure Maintenance	6,000
Pump Maintenance	5,000
Groundwater Sampling	1,200
Laboratory Sample Analyses	5,000
Contingency (15%)	34,000
TOTAL ANNUAL COSTS	$264,000
Present Worth Analysis (10% over 5 years)	$1,001,000
Salvage Value	(56,000)
Total Present Worth	$1,379,000

MCLs are relevant and appropriate at Hedblum for groundwater protection because the aquifers underneath the site and subdivision are considered drinking water aquifers, and MCLs are the enforceable drinking water standard for public water supplies. Since MCLs apply to water at the point of use, these levels are appropriate for establishing water quality in the drinking water aquifers at the site and the subdivision. These standards will be applied to the groundwater itself to ensure safe levels in the groundwater underneath the site and subdivision.

B. Federal Surface Water ARAR - Ambient Water Quality Criteria (AWQC) established under the Clean Water ACT (CWA)

The CWA is an ARAR at this site since the treated groundwater will be discharged to the surface water body (bayou) northeast of the site. The AWQC are established for protection of freshwater aquatic organisms. AWQC will be met at the point of groundwater discharge to the bayou. Additionally, Section 404 of the CWA regulates construction in a wetland. To the extent the swampy area and bayou are determined to be a wetland, and to the extent the placement of the groundwater intake and discharge pipes in the wetland is determined to be construction, the appropriate substantive requirements of Section 404 will be met.

STATE ARARs

A. Water Resources Commission Act (Act 245)

Act 245 Part 4 Rule 57 prohibits the presence of toxic substances at levels which may be injurious to the public health safety or welfare. This rule establishes the procedure for developing allowable levels of toxic substances in the surface waters of the State. The Rule 57(2) Guidelines are utilized in making water-quality based permit recommendations. The substantive requirements of these guidelines will be met by the discharge to the bayou.

Act 245 Part 9 defines the requirements for hydrogeologic study and groundwater monitoring. The substantive requirements will be complied with when installing the groundwater monitoring wells.

Act 245 Part 21 requires an NPDES permit for waste effluent into the waters of the State, and reporting of the wastewater discharge. The substantive requirements of this Act will be met without administratively acquiring a permit. CERCLA section 121(e) exempts on-site activities from obtaining permits. The purpose of this exemption is to allow CERCLA response actions to proceed without the delays that could result while waiting for other offices or agencies to issue a permit.

B. Mineral Well Act (Act 315) and Act 368

Act 315 Administrative Rules and Act 368 require that test wells be permitted, constructed properly, recorded, and properly plugged upon abandonment. These Acts are ARARs and the substantive requirements of these Acts will be met.

C. Act 203 of 1979 (The Wetland Protection Act)

Act 203 requires a permit before construction can begin in a wetland. The Act specifies the technical information that must be included before the permit will be granted. The piping for the groundwater system will be placed in the swampy area adjacent to the bayou. If the placement of those pipes is considered construction, and the swampy area is considered a wetland, the appropriate substantive requirements of this Act will be met.

D. Act 346 of 1972

This Act also requires a permit to construct surface water discharge piping to inland lakes and streams. The substantive requirements of this Act will be met.

E. Act 98 of 1913 (The Waterworks and Sewerage System Act)

Act 98 regulates the construction of industrial waste treatment plants. To the extent that the groundwater treatment unit can be characterized as such a treatment plant, the substantive requirements of the Act will be met.

Cost Effective

The selected remedy is cost effective because it has been determined to provide overall effectiveness proportional to its costs, the estimated total present worth being $1,379,000. Alternative 3 and Alternative 5 provide the most permanent overall protection of public health and the environment by treating contaminated groundwater and eliminating the primary risk identified by the public health/environmental risk assessment. However, Alternative 5 includes soil remediation which according to the presently available information and the risk assessment does not pose an unacceptable risk (though additional soil investigation will be conducted to verify the nature and extent of the contamination). This soil remediation, which is presently deemed to be unnecessary, costs an extra $535,000.

Utilization of Permanent Solution and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The selected remedy has been determined to represent the maximum extent practicable to which permanent solutions and treatment technologies can be utilized. For the most part, each of the alternatives are

easily implementable with no unusual short term problems. Alternative 3 will reduce and possibly eliminate the groundwater contamination depending on the distribution of VOC contamination in the aquifer. Whereas, Alternative 2 and Alternative 5 also offer comparable degrees of permanence, Alternative 2 does not offer protection of the environment and Alternative 5 is not as cost effective as Alternative 3. Alternatives 1, 4, and 6 provide considerably less protection of the environment than Alternative 3, as they do not remediate the contaminated groundwater.

Preference for Treatment as a Principal Element

The statutory preference for remedies that employ treatment which permanently and significantly reduces the toxicity, mobility or volume of hazardous substances as a principal element is satisfied by Alternative 3. The principal risk identified by the risk assessment is the ingestion of and incidental contact with the contaminated groundwater. The selected remedy extracts the groundwater and treats it using activated carbon adsorption to reduce the toxicity and volume of hazardous substances.

RESPONSIVENESS SUMMARY
HEDBLUM INDUSTRIES SITE

The United States Environmental Protection Agency (U.S. EPA) has recently completed a Remedial Investigation/Feasibility Study (RI/FS) regarding the Hedblum Industries site located near Oscoda, Michigan. During the RI/FS, information was collected on the nature and extent of contamination at Hedblum Industries and alternatives for appropriate remedial action were developed and evaluated. At the conclusion of the FS, a Proposed Plan was finalized by U.S. EPA which identified the preferred remedial alternative for the Hedblum Industries site. U.S. EPA held a public comment period from July 24 to August 23, 1989 for interested parties to comment on the U.S. EPA's May 1989 Feasibility Study Report and the Proposed Plan. Comments were also submitted on September 6, 1989 with U.S. EPA's approval.

The purpose of this Responsiveness Summary is to document the comments received during the public comment period and U.S. EPA's responses to the comments. All of the comments summarized in this document were considered prior to U.S. EPA's final decision.

I. RESPONSIVENESS SUMMARY OVERVIEW

The feasibility study identified and evaluated alternative remedial actions for the Hedblum Industries site. Six detailed alternatives were evaluated based on the nine criteria analysis as described in the Decision Summary. Based upon this detailed evaluation, available information, and public comments, the U.S. EPA has determined that the most appropriate remedy for the Hedblum Industries site is Alternative 3: Pump and Treat Contaminated Groundwater.

The major components of the selected remedy include:

- Installation of an extraction well system in the AuSable Heights subdivision (3 wells) and one extraction well on-site directly downgradient of the plant. Each well will extract 150 gallons per minute.

- The extracted groundwater will be pumped to the site and treated using granular activated carbon adsorption. The effluent from this treatment process will be analyzed to verify it meets discharge limits and will be discharged to the bayou. Groundwater quality in the aquifer will be monitored during the treatment process. Affected operating residential wells will also be monitored and appropriate action will be taken to supply an alternate source of potable water in the event that contamination exists in the wells at unacceptable levels. Spent carbon from the treatment process will be handled as a hazardous waste by the carbon supplier and regenerator.

- Additional subsurface soil investigation will be performed on-site in both the saturated and unsaturated zones to further define the magnitude and extent of soil contamination and to determine if there is a need for soil remediation.

II. BACKGROUND ON COMMUNITY INVOLVEMENT

Historically, public interest with the Hedblum Industries site has fluctuated. The 1973 discovery of TCE contamination of private wells resulted in much community interest. This concern subsided with the replacement of contaminated wells with deeper wells which supplied an alternate water supply. In 1977, these replacement wells also became contaminated and community interest increased greatly. In August 1977, the AuSable Township Board held a public meeting to inform the residents about the contamination problem. At this well attended meeting, the MDNR and local health officials described the problem and recommended that the Oscoda Township municipal water supply system be extended to serve the AuSable Heights subdivision. Most of the residents favored the proposal. However, some objected to the cost of connecting to the system. Presently, eighty of the ninety residences are connected to the water system. After being supplied with a safe drinking water supply, public interest once again diminished. Local officials have received few inquiries regarding the TCE contamination since then.

As part of the community relations program, two information repositories have been established near the site, one at the AuSable Township Hall and the other at the Oscoda Public Library. The administrative record has been placed in the repositories for public review.

U.S. EPA notified the local community, by way of the Proposed Plan, of the preferred remedial alternative for the Hedblum Industries site. To encourage public participation in the selection of a remedial alternative, U.S. EPA scheduled a public comment period from July 24 to August 23, 1989. In addition, U.S. EPA held a public meeting on August 10, 1989, to discuss the Feasibility Study and the Proposed Plan. Four people attended this meeting. Comments received during the public meeting and the public comment period, including comments submitted on September 6, 1989 with U.S. EPA's approval, are included in this Responsiveness Summary, along with U.S. EPA's responses.

III. SUMMARY OF COMMENTS RECEIVED AND U.S. EPA'S RESPONSE TO THE COMMENTS

Comments raised during the Hedblum Industries public comment period are summarized below.

1. COMMENT:

ERM North Central, Inc., at the direction of Amtel, Inc. (a potentially responsible party); a local citizen; and, the Michigan Department of Public Health would like to have the remaining residents still using private wells in the AuSable Heights subdivision connected to the municipal water system.

U.S. EPA'S RESPONSE:

U.S. EPA is confident that the public health will be protected through the monitoring of the private wells that are still being used for drinking water. To ensure that these wells are safe, U.S. EPA Emergency Response personnel will be conducting residential well sampling in October 1989. During the remediation at the Hedblum Industries site, groundwater quality and movement will be monitored, including these residential wells still in use. If at any time it is revealed that there is a threat to the public health from the use of these private wells, action will be taken to supply those affected residences with an alternate supply of potable water.

2. COMMENT:

The Michigan Department of Public Health is concerned with the potential hydraulic interference with the Oscoda Township municipal water wells caused by the installation and operation of extraction wells called for in the remedy.

U.S. EPA'S RESPONSE:

The actual design and placement of the extraction wells will take this concern into account during the remedial design phase of the project.

3. COMMENT:

A local citizen is concerned about the disposal of carbon from the carbon adsorption process.

U.S. EPA'S RESPONSE:

The spent carbon from the carbon adsorption water treatment process will be handled as a hazardous waste by the carbon supplier and regenerator. This spent carbon will be taken off of the site and regenerated.

4. COMMENT:

A local citizen had a concern about the discharge of phosphates or other nutrients into the bayou through the water treatment process.

U.S. EPA'S RESPONSE:

It is not anticipated that through the carbon adsorption treatment of the contaminated groundwater there would be the addition of phosphates or other nutrients which would be discharged into the bayou.

5. COMMENT:

A local citizen was concerned about the contaminants in fish from the bayou.

U.S. EPA'S RESPONSE:

The Public Health/Environmental Risk Assessment, performed as part of the Remedial Investigation, evaluated the potential exposure to local residents of ingesting fish caught in the bayou. Under the average case, it is assumed that 113 grams of fish are consumed once every two weeks for seven months over a five year period. The total potential lifetime excess cancer risk is below U.S. EPA's point of departure of 1×10^{-6} for this average exposure scenario. Under the plausible maximum case, it is assumed that 340 grams of fish are consumed once a week for seven months over a period of twenty years. The carcinogenic risk is 3×10^{-5}, which exceeds the U.S. EPA point of departure of 1×10^{-6}. However, this risk is likely to be overestimated based on bioconcentration factors used in estimating concentrations in fish, assumptions made regarding the persistence of measured concentrations year round and into the future, and the assumption that predicted concentrations in fish are present at the time of ingestion.

6. COMMENT:

ERM North Central, Inc. has expressed a concern that the Remedial Investigation/Feasibility Study is lacking in information and more study is needed. They believe that the assumptions led to erroneous conclusions and predictions.

U.S. EPA'S RESPONSE:

U.S. EPA believes that the Remedial Investigation/Feasibility Study contains sufficient information for the agency to make a decision with regard to selecting a remedy for the Hedblum Industries site. The information gathered is for this decision-making purpose and is not necessarily sufficiently detailed enough to base the actual design upon. U.S. EPA agrees that more data needs to be gathered to support the no action soils remedy and to design the groundwater remedy.

7. COMMENT:

ERM North Central, Inc. has expressed a concern that the soil borings analysis was not available before the monitoring wells were installed and could have provided valuable insight to the installation. They believe that some wells may have been screened below the depth of maximum contamination and may not accurately reflect the existing contaminant concentrations.

U.S. EPA'S RESPONSE:

During monitoring well installation, split-spoon samples were collected at the deep wells in each well nest and at the background well. These samples were collected for lithologic description and analytical purposes. Borehole gamma logging was originally proposed for all wells to assist in screen placement. However, due to the homogeneous nature of the site soils, gamma logging was not necessary. The deeper wells were screened in the lowest 10 feet of the aquifer and the shallower wells were screened based on organic vapor analyzer results but generally were in the upper 10 feet of the aquifer.

8. COMMENT:

ERM North Central, Inc. expressed a concern about whether the contours of the water table have substantiating data which results in a northeasterly groundwater flow direction rather than a more easterly or east-northeasterly direction. If the flow is more easterly, the placement of the monitoring wells could potentially have only delineated half of the contaminant plume.

U.S. EPA'S RESPONSE:

Water table contours for the Hedblum Industries site were constructed from July 1987 water level data for the twenty three groundwater monitoring points listed in Table 4-2 of the Remedial Investigation Report. This data indicates that groundwater flows in a northeasterly direction toward the bayou. Other studies have also indicated that the groundwater flow is to the northeast. A groundwater contamination study prepared by Soils and Materials Engineers, Inc. in 1976 took groundwater elevation measurements in November 1975 and January 1976 which resulted in an indicated groundwater gradient of 73.8×10^{-4} ft/ft sloping downward at north, 57 degrees east. In a 1982 MDNR hydrogeological study, water levels were taken in January 1982 and in May 1982 which showed groundwater moving northeast towards the AuSable Heights residences. Thus, it is likely that the contaminant plume has been characterized with the placement of the monitoring wells based upon this information.

9. COMMENT:

ERM North Central, Inc. believes that the cleanup time is underestimated.

U.S. EPA'S RESPONSE:

The estimated implementation time of four to five years for the selected remedy, Pump and Treat, includes an estimated pumping time of approximately two and a half years. It is recognized that the estimated calculations made are preliminary in nature and have been based upon a limited data set and a number of simplifying assumptions. As additional data becomes available, the calculations may prove to be inaccurate. The more detailed data that needs to be gathered for the design of the remedy may allow for a more accurate calculation of the cleanup time than the present estimate. U.S. EPA believes that the time estimates were adequate for comparing the remedial alternatives and for selecting a remedy.

10. COMMENT:

The Michigan Department of Natural Resources (MDNR) submitted a letter dated September 27, 1989, which stated that MDNR concurs with the remedial technology selected for the Hedblum Industries site, but does not concur with the target cleanup level for Trichloroethene (TCE).

U.S. EPA'S RESPONSE:

The U.S. EPA welcomes the State's concurrence on the remedial technology proposed for the site. However, the MDNR raises significant issues regarding compliance with State laws. MDNR specifically cites Act 245, and its rules. These rules restrict degradation of waters of the State, and apply to indirect or direct "addition of materials to groundwater from any facility or operation which acts as a discrete or diffuse source..." R323.2202(j). The MDNR further asserts that, "...to reflect Act 245 and Part 22, the target groundwater cleanup level for TCE should be set at 1 ppb rather than 5 ppb..."

Section 121(d)(2)(A) of the amended CERCLA states that remedies must comply with "any promulgated standard, requirement, criteria, or limitation under a State environmental or facility siting law that is more stringent than any Federal standard, requirement, or limitation" if applicable or relevant and appropriate to the hazardous substance or release in question. General State goals that are contained in a promulgated statute and implemented via specific requirements found in

the statute or in other promulgated regulations are potential ARARs. Where such promulgated goals are general in scope, e.g. a general prohibition against discharges to the waters of the State, compliance must be interpreted within the context of implementing regulations, the specific circumstances at the site, and the remedial alternatives being considered.

The U.S. EPA accepts that a nondegradation law can be an ARAR. However, the specific regulations which implement a general goal are key in identifying what compliance with the goal means. If a state has not promulgated implementing regulations, then the U.S. EPA would have considerable latitude in determining how to comply with the goal. The U.S. EPA may consider guidelines the state has developed related to the provision, as well as state practices in applying the goal, but such guidance would not be ARAR.

The State of Michigan contends that Act 245 is an ARAR for this site. The State cites that "these rules restrict degradation of waters of the State of Michigan, are more stringent than MCLs, and apply to indirect or direct 'addition of materials to groundwater from any facility or operation which acts as a discrete or diffuse source...'" A literal reading of the Act and its rules indicates that the law is prospective and is intended to prevent degradation of groundwater quality. The remedy at the Hedblum Industries site consists of extracting contaminated groundwater, treating (removing) the contaminants, and discharging the treated water into a surface water body. Therefore, the U.S. EPA does not find Act 245 and its Part 22 Rules to be ARAR. However, U.S. EPA fully supports the State's goal to ensure that the waters of the State are protective of the public health and welfare.

The State asserts that its 1 ppb cleanup goal for TCE is based on Act 245, and Part 22. Unfortunately, neither Act 245, nor the Part 22 Rules, provide specific remediation goals for the contaminants of concern. We note that the only discussion regarding specific concentration levels found in Part 22 Rules appears in 323.2205(3) which states: "Materials at concentrations that exceed the maximum contaminant levels for inorganic and organic chemicals...which are promulgated pursuant to the safe drinking water act 42 U.S.C. 300f, shall not be discharged into ground waters in usable aquifers..." Therefore, even if Act 245 and Part 22 Rules were considered to be ARAR, the rules do not provide specific criteria or numerical standards which could be applied in establishing remedial cleanup goals. Consequently, U.S. EPA established the cleanup goals for the Hedblum Industries site.

The U.S. EPA has developed a consistant policy regarding remediation goals for groundwater. This policy may be found in the December 21, 1988 proposed revisions to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The U.S. EPA has stated its policy that for surface or groundwater that is or may be used for drinking, MCLs are generally relevant and appropriate as cleanup standards. The basis for this policy was that MCLs are protective of human health and represent the level of water quality that U.S. EPA believes is acceptable for over 200 million Americans to consume every day from public drinking water supplies. As the enforceable standard for public water supplies, MCLs are fully protective of human health and, for carcinogens, fall within an acceptable lifetime risk range of 1×10^{-4} to 1×10^{-7}. When MCLs do not exist for contaminants identified in the groundwater at a site, the Superfund program will use other standards, advisories or criteria to determine if the response action will achieve a level of protection within a range of 1×10^{-4} to 1×10^{-7} individual lifetime excess cancer risk.

The remedy proposed for the Hedblum Industries site establishes cleanup goals for several contaminants. For example, U.S. EPA proposes to use MCLs as the target cleanup levels for Trichloroethene (5ppb), Benzene (5 ppb), Carbon Tetrachloride (5ppb), and Vinyl Chloride (2 ppb). If one were to express the risks posed by these contaminants, at these concentration levels, one would find that 5 ppb of TCE represents a lifetime risk of 1.5×10^{-6}, Benzene represents a 4.1×10^{-6} risk, Carbon Tetrachloride represents a 1.8×10^{-5} risk, and Vinyl Chloride represents a 1.3×10^{-4} risk. Although the MDNR letter states: "MDNR does not support the use of MCL's as target cleanup levels..," there is no discussion regarding the cleanup levels for contaminants other than TCE. The State simply argues that the MCL for TCE is unacceptable, without providing any supporting documentation, or evidence of an overarching rationale for selecting more stringent cleanup goals for particular contaminants. A 1 ppb concentration level for TCE represents a 3.14×10^{-7} lifetime risk. This risk, deemed acceptable by the MDNR for TCE, is an order of magnitude less than the risks deemed acceptable for the other contaminants. The U.S. EPA recognizes that there may be circumstances when individual cleanup goals may be adjusted to ensure that a remedy provides a level of protectiveness within the U.S. EPA's accepted risk range. The remedy selected for the Hedblum Industries site does not exceed the risk range, so adjustments to the cleanup goals are not required. Given the inherent inconsistencies presented by the State's insistence on a 1 ppb cleanup level for TCE at this site, the U.S. EPA maintains that MCLs are protective, and declines to adopt a 1 ppb cleanup goal for TCE.